BULLETIN OF MISCELLANEOUS INFORMATION No. 8 1939
ROYAL BOTANIC GARDENS, KEW

XLIV—EXPERIMENTS WITH PLANT GROWTH-SUBSTANCES FOR THE ROOTING OF CUTTINGS.

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When the use of the so-called synthetic plant "growth-substances" was first recommended to facilitate the rooting of cuttings, very little information was available concerning the efficacy of these treatments for more than a very limited number of species and varieties. The early tests, and notably those carried out at the Boyce Thompson Institute in the U.S.A., demonstrated that the rooting of holly cuttings and of a certain number of other plants could be considerably expedited. These results were afterwards confirmed and amplified in this country by the work of Dr. M. A. H. Tincker at Wisley. Subsequently, in order to obtain optimum results, it has been found desirable to ascertain the correct concentration of the most suitable "growth-substance," duration of treatment and other conditions for each species or variety. It cannot be too strongly emphasized that, while very beneficial results can be obtained with a wide range of species by the use of "growth-substances," they do not provide a "cure" for all propagating difficulties. Practical skill and knowledge is as necessary in dealing with a cutting after it has been treated with a "growth-substance" as it is for one without previous treatment. The selection and preparation of the cuttings also require the knowledge of a skilled practical man. At the same time, provided the correct treatment is used for each species, a good propagator would undoubtedly secure better results than if he attempted to root cuttings of the same species in the ordinary way. It is well known that the advantages which may be expected are (1) earlier rooting of cuttings, (2) more roots per cutting, and (3) a higher percentage of "strikes." In spite of all the research work on the subject which has been done, however, there still remains a number of species, especially amongst those which are difficult to propagate by normal means, for which satisfactory treatments have not yet been devised.

Experiments conducted at Kew, in collaboration with the gardens staff, have yielded data concerning the propagation of a number of horticultural plants which it seems worth while to place on record. To facilitate easy reference, the plants have been arranged in alphabetical order under their botanical names, and the experimental results expressed in tabular form. No claim is

made that the treatments which have given good results are necessarily the best that can be devised. Probably with more experience it would be possible to effect further improvements. In our experiments, it has not always been possible to secure enough cuttings to enable a range of concentrations of each " growth-substance " to be tested on any one species. Even if it had been possible to prepare cuttings in sufficient numbers for this purpose there would still have been the difficulty of finding accommodation for them in the propagating frames. It is felt, however, that the results which have been secured so far may serve as a useful guide to those who are anxious to propagate any of the species on the list. If further interesting results are obtained in the future with the same or any other species it is proposed to record them.

Experimental Method.

The results given below were obtained in the propagating pits which are normally used for these species at Kew, the cuttings in most instances being struck in sand after treatment with the different solutions. Cuttings of Ericaceous plants, on the other hand, were mostly rooted in a mixture of peat and sand. The frames were supplied with bottom heat. The " growth-substances " were applied by placing cuttings in glass jars of solution overnight for a period of 17–24 hours, so that the basal $\frac{1}{4}$ to 1 inch of the cutting was immersed in the solution. This was generally done in a well lighted and ventilated potting-shed close to the propagating pits. The herbaceous species, however, were treated in the pit in which they were subsequently rooted.

Exact numerical classification of results for each treatment of each species are omitted to permit the report to assume reasonable length, but generally speaking there were about 10 cuttings in each treatment, and a similar number of controls.

The key to the letters denoting treatments is :

A. Water.
B. Beta-indolylacetic acid 20 mgm./litre (1 : 50,000)
C. ,, ,, ,, 50 ,, ,, (1 : 20,000)
D. Beta-indolylbutyric acid 20 mgm./litre (1 : 50,000)
E. ,, ,, ,, 50 ,, ,, (1 : 20,000)
F. Alpha-naphthylacetic acid 20 mgms./litre (1 : 50,000)
G. ,, ,, ,, 50 ,, ,, (1 : 20,000)

Response to treatment means that cuttings rooted earlier and/or possessed better developed root systems and/or a larger proportion of cuttings rooted than the controls (Treatment A).

In the " Degree of Response " column :

D=Definite response.
M=Moderate response.
S=Slight response.

Experimental Results.

The names recorded below have been checked at Kew and are correct according to the International Rules of Nomenclature.

Key No.	Species.	Date of treatment.	Date of examination.	Remarks.	Treatments showing no response.	Treatments showing response.	Degree of response.	Treatments showing best response.
182	*Abelia chinensis* R. Br.	27.9.38	20.10.38	Number of cuttings rooted and bulk of roots increased by all treatments.	—	C, E, G	D for C & E S ,, G	C≡E
64	*Abelia Schumannii* Rehd.	8.7.38	27.7.38, 25.8.38	Not a good trial. C & G are better than A.	—	C, G	M. for C & G	G
34	*Abeliophyllum distichum* Nakai	5.7.38	2.8.38	Response in number rooted and bulk of root.	—	C, E & G	D for C, E & G	C
75	*Acantholimon glumaceus* Boiss.	13.7.38	27.9.38	No effect. Mostly dead.	C, G	—	—	—
	Aegle see *Poncirus*.							
84	*Alnus glutinosa* Gaertn. var. *aurea* Versch.	13.7.38	8.11.38	No effect. All dead.	C, G	—	—	—
889	*Alnus glutinosa* Gaertn. var. *imperialis* Petzold & Kirchn.	13.7.38	27.9.38	No effect. All dead.	C, G	—	—	—
90	*Alnus glutinosa* Gaertn. var. *laciniata* Willd.	13.7.38	8.11.38	No effect. All dead.	C, G	—	—	—
81	*Alnus glutinosa* Gaertn. var. *quercifolia* Loud.	13.7.38	27.9.38	No effect. All dead.	C, G	—	—	—
85	*Alnus hirsuta* Turcz. var. *sibirica* Schneid.	13.7.38	27.9.38	No effect. All dead.	C, G	—	—	—
88	*Alnus incana* Willd. var. *aurea* Schelle f. *variegata* Hort.	13.7.38	8.11.38	No effect. All dead.	C, G	—	—	—
87	*Alnus incana* Willd. var. *pendula* Callier	13.7.38	27.9.38	No effect. All dead.	C, G	—	—	—
74	*Anthyllis Barba-Jovis* L.	13.7.38	3.8.38	Response in number rooted.	C	G	D for G	G
78	*Anthyllis Hermanniae* L.	13.7.38	2.8.38	No effect. All dead.	C & G	—	—	—
107	*Arctostaphylos Manzanita* Parry	19.7.38	27.9.38	No effect. All dead.	C, E, G	—	—	—
149	*Arctostaphylos Manzanita* Parry	8.9.38	27.9.38	Response in number rooted.	C & G	E	D for E	E
186	*Arctostaphylos Manzanita* Parry	27.9.38	29.11.38	No effect. Mostly dead.	C, E, G	—	—	—

Key No.	Species.	Date of treatment.	Date of examination.	Remarks.	Treatments showing no response.	Treatments showing response.	Degree of response.	Treatments showing best response.
23	*Atraphaxis Muschketowii* Krassn.	23.6.38	27.7.38	No effect. All dead.	B, D, F	—	—	—
76	*Betula nana* L. var.	13.7.38	2.8.38	Response in number rooted.	—	C & G	D for C S ,, G	C
168	*Betula pendula* Roth var. *viscosa* Rehd.	8.9.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
119	*Buddleja alternifolia* Maxim.	23.6.38	5.7.38	Definite response to C, G, & to E in number rooted and amount of root.	—	E, C & G	D for E & G M ,, C	E
94	*Carrierea calycina* Franch.	13.7.38	8.11.38	No effect. All dead.	C, G	—	—	—
155	*Carrierea calycina* Franch.	8.9.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
79 & 80	*Ceanothus arboreus* Greene	13.7.38	27.9.38	No effect. Mostly dead.	C, G	—	—	—
106	× *Ceanothus Burkwoodii* Hort.	19.7.38	25.8.38	Response in number rooted and bulk of root.	G	C & E	M for C & E	C≡E
99	*Ceanothus* "Autumnal Blue"	19.7.38	25.8.38	Response in number rooted.	—	C, E & G	M for C, E & G	C≡E≡G
62	*Ceanothus* "Gloire de Versailles"	8.7.38	27.9.38	Response in number rooted.	—	C & G	M for C & G	C≡G
91	*Ceanothus* "Henri Defosse"	13.7.38	25.8.38	No effect. All equally rooted.	C & G	—	—	—
146	*Ceanothus thyrsiflorus* Eschsch.	8.9.38	20.10.38	Response in number rooted and bulk of root.	E, G	C	S for C	C
147	× *Ceanothus Veitchianus* Hook.	8.9.38	20.10.38	No effect. Mostly dead.	C, E, G	—	—	—
72	*Ceratostigma* 2715 G.S.	13.7.38	27.7.38	Response in number rooted and bulk of root.	G	C	D for C	C
102	*Chaenomeles Lagenaria* Koidz. var. *umbilicata* Hort. (*Cydonia Lagenaria* Lois. var. *umbilicata* Hort.)	19.7.38	25.8.38	Slight response in number rooted C & E. Definite ditto G.	—	C, E & G	D for G S ,, C & E	G

Key No.	Species.	Date of treatment.	Date of examination.	Remarks.	Treatments showing no response.	Treatments showing response.	Degree of response.	Treatments showing best response.
185	*Chimonanthus fragrans* Lindl. var. *luteus* Hort.	27.9.38	29.11.38	No effect. Mostly dead.	C, E & G	—	—	—
17	*Cistus* " Silver Pink "	23.6.38	13.7.38 27.7.38	No effect at 13.7.38. Response in number at 27.7.38.	G	E	D for E M ,, C	—
170	*Clematis montana* Buch.-Ham. var.	8.9.38	29.11.38	Response in number of cuttings rooted.	C, G	E	M for E	E
5	*Cornus florida* L. var.	21.6.38	27.7.38	Response in number of cuttings rooted.	E, G	C	S for C	C
150	*Cornus Kousa* Buerg. var. *chinensis* Osborn	8.9.38	20.10.38	Response in number rooted.	C	E & G	M. for E & G	E≡G
56	*Cornus macrophylla* Wall.	8.7.38	8.11.38	No effect. All dead.	C, G	—	—	—
22	*Cornus Nuttallii* Audub.	23.6.38	27.7.38	Response in number rooted.	—	C, E & G	D for G M ,, C S ,, E	G
137	*Cornus Nuttallii* Audub.	3.8.38	27.9.38	No effect. All dead.	C, E, G	—	—	—
40	*Cornus Nuttallii* Audub.	5.7.38	2.8.38	No effect. Mostly dead.	C, E & G	—	—	—
52	*Cotinus americanus* Nutt. (*Rhus cotinoides* Nutt.)	5.7.38	2.8.38	No effect.	C, E, G	—	—	—
36	*Cotinus Coggygria* Scop. var. *purpureus* Rehd. (*Rhus Cotinus* L. var. *atropurpurea* Dipp.)	5.7.38	2.8.38	Response in number rooted.	—	C, E & G	M for C, E & G	E
55	*Cotoneaster glabrata* Rehd. & Wils.	8.7.38	27.9.38	No effect. Equally rooted.	C & G	—	—	—
	Cydonia see *Chaenomeles*.							
77	*Cytisus Battandieri* Maire	13.7.38	8.11.38	No effect. All dead.	C, G	—	—	—
124	*Cytisus scoparius* Link var. *pendulus* Nichols.	26.7.38	25.8.38	Response in number rooted.	E	C & G	S for C & G	C ≡ G

Key No.	Species.	Date of treatment.	Date of examination.	Remarks.	Treatments showing no response.	Treatments showing response.	Degree of response.	Treatments showing best response.
95	*Daphne pontica* L.	13.7.38	25.8.38	Response in number rooted.	—	C, E & G	M for C, E & G	C≡G≡ — E —
25	× *Diervilla hybrida* Klenert var. *styriaca* Klenert	23.6.38	5.7.38	Response in number rooted.	B	D & F	D for D & F	D≡F
21	*Dipelta floribunda* Maxim.	23.6.38	19.7.38	Response in number rooted.	C	G. & E	D for G S ,, E	G
118	*Ehretia thyrsiflora* Nakai	26.7.38	27.9.38	Response in number rooted.	—	C, E & G	D for E, S for C & G	E
27	*Emmenopterys Henryi* Oliv.	23.6.38	27.7.38	No effect. All dead.	B, D & F	—	—	—
122	*Emmenopterys Henryi* Oliv.	26.7.38	27.9.38	No effect. Equally rooted.	C, E & G	—	—	—
180	*Erica arborea* L. var. *alpina* Dieck	27.9.38	29.11.38	No effect. Mostly dead.	C, E, G	—	—	—
70	*Erica australis* L. var.	8.7.38	27.9.38	No effect. Mostly dead.	C & G	—	—	—
29	*Eucryphia glutinosa* Focke	23.6.38	27.7.38	No effect. Mostly dead.	B, D & F	—	—	—
130	*Eucryphia glutinosa* Focke	27.7.38	27.9.38	No effect. All dead.	C, E & G	—	—	—
37	*Exochorda racemosa* Rehd.	5.7.38	2.8.38	Response in number rooted.	C & G	E	D for E	E
105	*Exochorda racemosa* Rehd.	19.7.38	25.8.38	Response in number rooted.	—	C, E & G	D for C&E M ,, G	C≡E
43	*Fabiana imbricata* Ruiz & Pav. f. *violacea* Hort.	5.7.38	2.8.38	No effect. Mostly dead.	C, E & G	—	—	—
156	*Fabiana imbricata* Ruiz & Pav. f. *violacea* Hort.	8.9.38	20.10.38	Response in number rooted.	C, G	E	—	E
69	*Feijoa Sellowiana* Berg	8.9.38	27.7.38	No effect. Mostly dead.	C & G	—	—	—
114	× *Forsythia intermedia* Zabel var. *spectabilis* Spaeth	26.7.38	25.8.38	Response in number rooted.	—	C, E & G	D for C, E & G	C≡E≡G

Key No.	Species.	Date of treatment.	Date of examination.	Remarks.	Treatments showing no response.	Treatments showing response.	Degree of response.	Treatments showing best response.
125	*Fothergilla Gardeni* Murr. var. *glauca* Hort.	26.7.38	25.8.38	Response in number rooted.	C	E & G	D for E M ,, G	E
92	*Fothergilla major* Lodd.	13.7.38	25.8.38	No effect. All dead.	C & G	—	—	—
93	*Fothergilla monticola* Ashe	13.7.38	27.9.38	No effect. All equally rooted.	C, G	—	—	—
67	*Garrya elliptica* Dougl.	8.7.38	27.7.38 25.8.38	Response in number rooted.	G	C	S for C	C
61	*Genista horrida* DC. var. *erinacea* Hort.	8.7.38	27.7.38	Response in number rooted.	C	G	D for G	G
139	*Halesia carolina* L.	2.8.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
136	*Halesia diptera* Ell.	2.8.38	1.12.38	No effect. Mostly dead.	C, E & G	—	—	—
141	*Hibiscus syriacus* L. var. *azureus* Hort.	3.8.38	27.9.38	No effect. Equally rooted.	C, E & G	—	—	—
142	*Hibiscus syriacus* L. var. *caerulea* Hort.	2.8.38	27.9.38	No effect. Mostly dead.	C, E & G	—	—	—
39	*Hydrangea integerrima* Engl.	5.7.38	2.8.38	No effect. All dead.	C. E & G	—	—	—
163	*Hydrangea integerrima* Engl.	8.9.38	20.10.38	Response in number rooted.	C, E	G	S for G	G
173	*Hydrangea macrophylla* DC. var. *Veitchii* Wils.	27.9.38	20.10.38	No effect. Equally rooted.	C, E, G	—	—	—
154	*Hydrangea paniculata* Sieb.	8.9.38	27.9.38	No effect. Equally rooted.	C, E & G	—	—	—
177	*Hypericum elatum* Ait. var.	27.9.38	20.10.38	Response in number rooted and bulk of roots for C & E. Bulk for G.	—	C, E, G	M for C S ,, E & G	C
166	*Ilex crenata* Thunb. var. *nummularia* Yatabe (*I. crenata* Thunb. var. *Mariesii* Dallimore)	8.9.38	20.10.38	Response in number rooted.	—	C, E, G	D for E & G M ,, C	G≡E

Key No.	Species.	Date of treatment.	Date of examination.	Remarks.	Treatments showing no response.	Treatments showing response.	Degree of response.	Treatments showing best response.
60	*Kalmia latifolia* L.	8.7.38	27.9.38	No effect. All dead.	C, G	—	—	—
71	*Leptospermum scoparium* Forst. var. *prostratum* Hort.	8.7.38	8.11.38	No effect. All dead.	C, G	—	—	—
97	*Leucothoë populifolia* Dipp. (*L. acuminata* G. Don).	19.7.38	27.9.38	Response in number rooted and bulk.	C	E & G	S for E & G	E≡G
135	*Liriodendron Tulipifera* L. var. *fastigiata* Hort.	2.8.38	27.9.38	No effect. All dead.	C, E & G	—	—	—
83	*Lonicera pyrenaica* L.	13.7.38	8.11.38	No effect. All dead.	C, G	—	—	—
191	*Magnolia Dawsoniana* Rehd. & Wils.	27.9.38	29.11.38	No effect. Mostly dead.	C, E, G	—	—	—
159	*Magnolia Lennei* Topf	8.9.38	29.11.38	No effect. Mostly dead.	C, E, G	—	—	—
160	*Magnolia liliiflora* Desrouss. var. *nigra* Rehd.	8.9.38	29.11.38	Response in number of rooted cuttings.	C, G	E	D for E	E
32	*Magnolia salicifolia* Maxim.	5.7.38	27.7.38	No effect. Mostly dead.	C, E, G	—	—	—
127	*Magnolia salicifolia* Maxim.	27.7.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
196	*Magnolia Sargentiana* Rehd. & Wils.	27.9.38	29.11.38	No effect. Mostly dead.	C, E, G	—	—	—
33	*Magnolia Sprengeri* Pamp.	5.7.38	27.7.38	No effect. All dead.	C, E, G	—	—	—
31	× *Magnolia Soulangeana* Soul. var. *superba* Hort.	5.7.38	27.7.38	Response in number rooted.	C & G	E	S for E	E
73	*Mahonia Nevinii* Fedde	13.7.38	27.9.38	No effect. All dead.	C, G	—	—	—
96	*Meliosma dilleniifolia* Wall.	19.7.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
24	*Meliosma Veitchiorum* Hemsl.	23.6.38	25.8.38	No effect. All dead.	B, D, F	—	—	—
111	*Michelia excelsa* Bl.	19.7.38	27.9.38	Response in number rooted.	C & E	G	S for G	G

Key No.	Species.	Date of treatment.	Date of examination.	Remarks.	Treatments showing no response.	Treatments showing response.	Degree of response.	Treatments showing best response.
172	*Morus nigra* L.	27.9.38	29.11.38	Response in bulk of roots	C, E	G	S for G	G
100	*Nothofagus antarctica* Oerst. var. *uliginosa* Reiche	19.7.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
194	*Nothofagus betuloides* Bl.	27.9.38	8.11.38	No effect. All dead.	B, D, F	—	—	—
13	*Nothofagus Dombeyi* Bl.	21.6.38	13.7.38 27.7.38	No effect on 13.7.38. Response in number of rooted cuttings to G on 27.7.38.	C, E	G	S for G	G
151	*Nothofagus Dombeyi* Bl.	8.9.38	29.11.38	No effect. Mostly dead.	C, E, G	—	—	—
101	*Nothofagus obliqua* Bl.	19.7.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
42	*Nothofagus procera* Oerst.	5.7.38	2.8.38	No effect. All dead.	C, G	—	—	—
164	*Nothofagus procera* Oerst.	8.9.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
30	*Nyssa sylvatica* Marsh.	23.6.38	8.11.38	No effect. All dead.	B, D, F	—	—	—
41	*Osmanthus Delavayi* Franch.	27.9.38 5.7.38	29.11.38 2.8.38	No effect. All dead. No effect. Equally rooted.	C, E, G C, E, G	—	—	—
119	*Oxydendrum arboreum* DC.	26.7.38	27.9.38	No effect. All dead.	C, E & G	—	—	—
143	*Parrotia persica* C. A. Mey.	2.8.38	1.12.38	Response in number of rooted cuttings.	—	C, E & G	D for E M ,, C S ,, G	E
109	*Peraphyllum ramosissimum* Nutt.	19.7.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
104	*Philadelphus* " Glacier "	19.7.38	27.9.38	Response in number rooted.	E, G	C	D for C	C
46	*Philadelphus microphyllus* Gray	5.7.38	2.8.38	Response in number rooted.	E, G	C	M for C	C
183	*Philadelphus microphyllus* Gray	27.9.38	20.10.38	Response in number rooted.	C & G	E	M for E	E

Key No.	Species.	Date of treatment.	Date of examination.	Remarks.	Treatments showing no response.	Treatments showing response.	Degree of response.	Treatments showing best response.
103	*Picea Breweriana* S. Wats.	19.7.38	27.9.38	No effect. All dead.	C, E, G	—	—	—
68	*Pieris* 29002 F.	8.7.38	8.11.38	No effect. All dead.	C, G	—	—	—
128	*Pieris formosa* D. Don var. *Forrestii* Airy-Shaw	27.7.38	29.11.38	Response in number of rooted cuttings.	C, G	E	M for E	E
138	*Poncirus trifoliata* Raf. (*Aegle sepiaria* DC.)	2.8.38	27.9.38	Response in number rooted.	C, G	E	M for E	E
3	*Potentilla* 28575 F.	21.6.38	5.7.38	Response in number rooted to C. Less to E.	G	C, E	D for C S ,, E	C
49	*Potentilla fruticosa* L. var. "Bowles"	5.7.38	19.7.38	Response in bulk of roots.	—	C, E, G	S for C, E & G	C≡E≡G
116	*Prunus cerasifera* Ehrh. 682 L.	26.7.38	1.12.38	No effect. Mostly dead.	C, E & G	—	—	—
9	*Prunus subhirtella* Miq. var. *autumnalis* Mak.	21.6.38	13.7.38	No effect. Mostly dead.	C, E & G	—	—	—
132	*Prunus subhirtella* Miq. var. *autumnalis* Mak.	27.7.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
26	*Prunus triloba* Lindl. var. *plena* Dipp.	23.6.38	13.7.38	Response in number rooted to D. No effect by B & F.	B & F	D	D for D	D
133	*Prunus triloba* var. *plena* Dipp.	27.7.38	25.8.38	Response in number rooted.	C	E & G	D for E & G	E≡G
110	*Purshia tridentata* DC.	19.7.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
175	*Pyracantha coccinea* Roem. var. *Lalandii* Dipp.	27.9.38	20.10.38	Response in number rooted.	C	E, G	D for E & G	E
158	*Quercus Engleriana* Seemen	8.9.38	20.10.38	E gave much better callus. Remainder dead.	—	E	S for E	E
152	×*Quercus kewensis* Osborn	8.9.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
35	*Raphiolepis umbellata* Mak.	5.7.38	2.8.38	Response in number rooted.	C & G	E	D for E	E

Key No.	Species.	Date of treatment.	Date of examination.	Remarks.	Treatments showing no response.	Treatments showing response.	Degree of response.	Treatments showing best response.
193	*Raphiolepis umbellata* Mak.	27.9.38	20.10.38	Response in number rooted.	C	E & G	D for E M „ G	E
12	× *Rhododendron altaclarense* Lindl.	21.6.38	27.7.38	No effect. All rooted.	C, E, G	—	—	—
10	*Rhododendron* "Davies II."	21.6.38	27.7.38	No effect. All dead.	C, E, G	—	—	—
11	*Rhododendron* "Dr. Chas. Bauman"	21.6.38	27.7.38	No effect. Mostly dead.	C. E & G	—	—	—
7	*Rhododendron* "Flamboyant"	21.6.38	27.7.38	No effect. Mostly dead.	C, E, G	—	—	—
57	*Rhododendron floccigerum* Franch.	8.7.38	8.11.38	No effect. All dead.	C, G	—	—	—
44	*Rhododendron hippophaoides* I. B. Balf. & W. W. Sm. var. *roseum* Hort.	6.7.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
15	× *Rhododendron impeanum* Hort.	23.6.38	27.7.38	No effect. Mostly dead.	C, E & G	—	—	—
117	× *Rhododendron impeanum* Hort.	26.7.38	8.11.38	No effect. All dead.	C, E & G	—	—	—
112	*Rhododendron indicum* Sweet var. *balsaminiflorum* Nichols.	26.7.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
115	*Rhododendron indicum* Sweet var. *balsaminiflorum* Nichols.	26.7.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
65	*Rhododendron mucronulatum* Turcz.	8.7.38	29.9.38	No effect. All dead.	C, G	—	—	—
2	*Rhododendron occidentale* A. Gray, Orange Red	21.6.38	27.7.38	Response in number rooted.	C & G	E	S for E	E
8	*Rhododendron occidentale* A. Gray, Pink	21.6.38	27.7.38	No effect. All dead.	C, E, G	—	—	—
1	*Rhododendron occidentale* A. Gray, White	21.6.38	27.7.38	Response in number rooted.	C & G	E	M for E	E
47	× *Rhododendron praecox* Carr.	5.7.38	29.11.38	Response in number rooted.	C	E, G	D for E & G	G

Key No.	Species.	Date of treatment.	Date of examination.	Remarks.	Treatments showing no response.	Treatments showing response.	Degree of response.	Treatments showing best response.
58	*Rhododendron russatum* I.B. Balf. & Forrest var. *roseum* Hort.	8.7.38	8.11.38	No effect. All dead.	C, G	—	—	—
	Rhus see *Cotinus*.							
	Rhynchospermum see *Trachelospermum*.							
129	*Ribes sanguineum* Pursh "King Edward VII."	27.7.38	25.8.38	No effect. Equally rooted.	C, E & G	—	—	—
98	Rose. "Crimson Conquest"	19.7.38	2.8.38	Response in number rooted.	—	C, E & G	D for E & G M ,, C	E
108	Rose. "Golden Rambler"	19.7.38	25.8.38	No effect. All equally rooted.	C, E, G	—	—	—
192	*Santolina Chamaecyparissus* L. var. *nana* Hort.	27.9.38	20.10.38	No effect. All dead.	C, E, G	—	—	—
131	*Schizophragma hydrangeoides* Sieb. & Zucc.	27.7.38	29.11.38	Response in number rooted.	G	C & E	S for C & E	C & E
4	*Sinojackia Rehderiana* Hu	21.6.38	13.7.38	Response in number and bulk of root E & G, bulk only C.	—	C, E & G	D for E M ,, G S ,, C	E
134	*Sinowilsonia Henryi* Hemsl.	2.8.38	27.9.38	No effect. All dead.	C, E, G	—	—	—
126	× *Spiraea arguta* Zabel	27.7.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
161	× *Spiraea arguta* Zabel	8.9.38	27.9.38	Response in number rooted.	—	C, E, G	M for C & E S for G	C≡E
162	*Spiraea prunifolia* Sieb. & Zucc. var. *plena* Schneid.	8.9.38	27.9.38	Response in number rooted.	G	C & E	S for C & E	C≡E
187	*Spiraea prunifolia* Sieb. & Zucc. var. *plena* Schneid.	27.9.38	20.10.38	Response in number rooted.	E	C & G	S for C & G	C≡G
16	*Stachyurus chinensis* Franch.	23.6.38	27.7.38	No effect. Mostly dead.	C, E & G	—	—	—

Key No.	Species.	Date of treatment.	Date of examination.	Remarks.	Treatments showing no response.	Treatments showing response.	Degree of response.	Treatments showing best response.
121	*Stachyurus chinensis* Franch.	26.7.38	27.9.38	No effect.	C, E & G	—	—	—
6	*Stewartia koreana* Nakai	21.6.38	19.7.38	Response in number rooted to E.	C, G	E	M for E	E
120	*Stewartia koreana* Nakai	26.7.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
28	*Stewartia Malachodendron* L.	23.6.38	27.7.38	Response in number rooted.	B	D & F	S for D & F	F
59	*Styrax Hemsleyana* Diels	8.7.38	29.11.38	No effect. All dead.	C, E, G	—	—	—
176	*Styrax philadelphoides* Perkins	27.9.38	29.11.38	Response in number rooted and bulk of roots.	C, E	G	D for G	G
82	*Teucrium fruticans* L.	13.7.38	2.8.38	Response in number rooted.	—	C, G	D for C & G	G
38	*Trachelospermum jasminoides* Lem. (*Rhynchospermum jasminoides* Lindl.)	5.7.38	2.8.38	Response in number rooted.	—	C, E & G	D for G M ,, E S ,, C	G
165	*Tsuga Jeffreyi* Henry	8.9.38	20.10.38	No effect. All dead.	C, E, G	—	—	—
145	*Ulex europaeus* L. var. *plenus* Schneid.	2.8.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
86	*Viburnum grandiflorum* Wall.	13.7.38	25.8.38	Response in number rooted.	—	C, G	D for C S ,, G	C
50	*Viburnum tomentosum* Thunb. var. *Mariesii* Veitch	5.7.38	19.7.38	Response in number rooted and in bulk of root.	G	C, E	D for C & E	C & E

Of the 168 species tested, approximately 45 per cent. have responded to one or other of the treatments. These include the following genera and species which are to be found in the list of plants which are difficult to propagate by means of cuttings which was prepared by the "Plant Hormone Committee" and recently published (Gard. Chron. **103,** 433 : 1938). *Arctostaphylos Manzanita, Betula nana, Cornus Nuttallii, Cotinus Coggygria* (*Rhus Cotinus*), *Dipelta floribunda, Fothergilla* sp., *Garrya elliptica, Genista horrida, Magnolia Soulangeana* var., *Nothofagus* sp., *Philadelphus microphyllus, Parrottia persica, Poncirus trifoliata* (*Aegle sepiaria*), *Quercus Engleriana, Spiraea arguta, Stewartia* spp.

The following species, which were also included in the same list, failed to respond :

Acantholimon glumaceus, Carrierea calycina, Cotinus americanus (*Rhus cotinoides*), *Cytisus Battandieri, Erica arborea* var., *E. australis* var., *Feijoa Sellowiana, Kalmia latifolia, Lonicera pyrenaica, Meliosma* sp., *Nyssa* sp., *Osmanthus Delavayi, Tsuga* sp.

Besides the above experiments, tests were also made during January, February and March of 1938 on a number of herbaceous plants, using beta-indolylacetic acid at concentrations of 1 : 20,000 or 1 : 40,000. Beneficial results at the lower of these concentrations were obtained with the following species :

Artemisia arborescens L., *Helichrysum rupestre* DC., *Helichrysum italicum* G. Don var. *microphyllum* Cambess. *Senecio leucostachys* Baker, and *Sutera grandiflora* Hiern. It was possible to work with larger numbers of cuttings per treatment with these species than with the shrubby ones already described. For instance 90 cuttings of *Senecio leucostachys* were treated and 40–60 of each of the others. Working with these larger numbers showed that the results were not always entirely consistent, even when apparently similar batches of cuttings were given the same treatment but inserted in different pots of the same sand in the same propagating frame. This was shown especially by *Helichrysum italicum* var. *microphyllum*, 60 cuttings of which were treated in beta-indolylacetic acid and there were 60 controls which were placed in water. As a matter of convenience, however, the cuttings were inserted in pots of sand containing thirty each so that there were two pots of treated and two of untreated cuttings. When the cuttings were examined the results were as follows :

	Lot 1.	*Lot* 2.
Treated ...	29 well rooted	28 well rooted.
Controls ...	24 ,, ,,	5 ,, ,,

Thus, although a beneficial result was obtained in both cases, the superiority of the treated over the control cuttings was very much greater in one than in the other. No satisfactory explanation for this discrepancy can be suggested, but it seems to emphasize the importance in propagation of other factors besides the "growth-substances" themselves.

About 80 varieties of chrysanthemum were treated with beta-indolylacetic acid at a concentration of 1 : 40,000, and compared with controls. In most instances it was possible to deal with only 4 to 6 cuttings of each variety per treatment, so that there was difficulty in assessing the value of the results obtained. Generally speaking, however, it may be said that there was no very outstanding difference between the treated cuttings and the controls, although in many instances a slight benefit was recorded, and with a limited number of varieties the benefit was much more definite. Variations in the responses of different varieties were also found to exist when larger numbers of cuttings were available. For instance when tests were made with beta-indolylacetic acid at a concentration of 1 : 20,000 on 43 " Coacher's Bronze " and 64 " Model of Perfection " there was no appreciable difference between the treated cuttings and the controls. The variety " Lillie," on the other hand, of which there were 54 treated and untreated respectively, took root after treatment very much more effectively and rapidly than the controls. The results of these rather limited tests on chrysanthemums seem to suggest that there is plenty of scope for further experiments on different cultivated varieties of this genus in order to obtain optimum results.

Somewhat inconclusive results were obtained with a number of *Dahlia* varieties, many of which rooted very easily without any treatment.

While the results recorded in this paper were obtained under the conditions specified it is, nevertheless, quite possible that the results might have been quite different under certain circumstances. For instance, no record has been kept of such variable factors as the age of the cutting or parent plant, or of the part of the plant from which the cutting was taken. Whether the parent plant was in a starved or well nourished condition might have a considerable influence on the nature of the result obtained. The temperature, humidity and light intensity during the treatment of the cutting might also partially control the response. The results to date, however, indicate that " growth-substances " are definitely of importance for propagating plants by cuttings, and they may become widely used for crops of economic importance. There is evidence with plants such as coffee, rubber, etc., that they may eventually be used on a commercial scale, but it is only by trial of the different materials at a range of concentrations for each particular species that reliable data will be obtained. From the results given in this paper it may be concluded that reasonable evidence exists in favour of undertaking experiments of this kind.

Summary.

The results recorded in this paper give details of the effects of treatment with solutions of synthetic plant growth-substances upon the rooting of a large number of trees, shrubs, and herbaceous plants.

The authors are very grateful for the invaluable assistance in making these experiments which has been afforded by members of the Gardens staff, without whose co-operation it would have been quite impossible to carry out this work.

Thanks are expressed by one of the authors (W. G. T.) to Messrs. Imperial Chemical Industries for permission to publish this paper.

XLV—CONTRIBUTIONS TO THE FLORA OF SIAM. ADDITAMENTUM LII.*

Gongronema filipes *Kerr* (Asclepiadaceae-Marsdenieae) ; species inter congeneres inflorescentia umbelliformi pendula, corona conspicua distincta.

Suffrutex volubilis, innovationibus minute fusco-puberulis, cito glabrescens ; caulis gracilis, teres, internodiis 7–14 cm. longis. *Folia* oblongo-ovata, basi rotundata vel leviter cordata, apice sat subito et longe acuteque acuminata, 8·4–11·5 cm. longa, 2·8–5 cm. lata, chartacea, glabra, siccitate supra olivacea, subtus pallide fulvo-cineracea obscure punctata et nervis fuscis reticulata, costa nervisque supra impressis subtus prominentibus, nervis lateralibus 3–4 paribus angulo 40°–45° e costa orientibus et 2–5 mm. a margine cum nervo undulato intramarginali conjunctis, rete venularum subconspicuo ; petiolus gracilis, supra canaliculatus et apice ad laminae junctionem glandulorum fasciculo instructus, minute puberulus. *Inflorescentia* multiflora, axillaris, umbelliformis, pedunculata, pendula ; pedunculus gracilis, minute puberulus, 1·2–7 cm. longus ; bracteae minutae, puberulae ; pedicelli graciles, puberuli, 5–7 mm. longi. *Calyx* 5-lobatus, extra sparse puberulus, intus basi glandulis 5 minutis instructus ; lobi late ovati, obtusi, circiter 1·5 mm. longi et lati. *Corolla* suburceolata, intus extraque glabra, lobis valvatis ; tubus 6 mm. longus, medio parum inflatus, fauce intus leviter incrassatus ; lobi subcarnosi, patuli, oblongi, obtusi, margine revoluti, 4 mm. longi et 2 mm. lati, siccitate intus nigro-brunnei extra pallide fusci. *Coronae squamae* basi tubi staminei adnatae, circiter 1 mm. longae, basi bicarinatae, apice acutae, incurvae. *Stamina* 3 mm. longa, appendicibus membranaceis 1·5 mm. longis stigma obtegentibus inclusis ; pollinia erecta, caudiculis horizontalibus parum longiora ; corpusculum ellipticum, polliniis parum brevius. *Stigmatis caput* sat longe productum, apice minute bilobum. *Folliculi* ignoti.

Chiengmai, Doi Lang Ka, *Put* 3768 (*type*). Doi Angka, 1490 m., evergreen forest, *Winit* 1332.

The Angka plant differs from the type in that the nerves beneath are nearly concolorous with the leaf surface.

Lygisma flavum (*Ridl.*) *Kerr*, comb. nov. *Gymnema flava* Ridley in Journ. Str. Br. Roy. As. Soc. **57**, 68 (1911). *Tylophora Ridleyi* Henderson in Gard. Bull. Straits Settlem. **7**, 111 (1933).

*Continued from K.B. 1939, 150.

PATTANI. Betong, c. 200 m., in scrub, *Kerr* 7488 !

An examination of the type number of this species shows that it is a *Lygisma*. As far as the flowers are concerned it is almost an exact match of *Lygisma angustifolium* Hook. f. as depicted in Hook. Icon. Pl. t. 1423. The leaves of the two plants are, however, quite different.

Lygisma inflexum (*Cost.*) *Kerr*, comb. nov. *Pilostigma inflexum* Cost. in Lec. Fl. Gén. Ind.-Chin. **4**, 73, fig. 12 (1912).

PAYAP. Ban Na Gorge, 150 m., open grassy spots, *Kerr* 2177, 3041.

Thanks to the courtesy of Professor H. Humbert, Director of the Phanerogamic Division of the Natural History Museum, Paris, the writer has been enabled to examine the collection of Thorel on which Costantin founded his monotypic genus *Pilostigma*. In its floral characters *Pilostigma* agrees with J. D. Hooker's genus *Lygisma*, to which, accordingly, it is here proposed to reduce it.

As fruit and seeds do not seem to have been described, either under *Lygisma* or *Pilostigma*, the following description has been drawn up from fruit on *Kerr* 3041 : *Folliculus* oblongus, subsuccosus, laevis, pruinosus, apicem versus parum attenuatus, circiter 6 cm. longus, basi 1 cm. diametro ; semina complanata, ovalia, 9 mm. longa, 7 mm. lata, apice coma alba circiter 16 mm. longa praedita.

Lygisma nervosum *Kerr* (Asclepiadaceae-Marsdenieae) ; species *L. inflexo* (Cost.) Kerr affinis, foliis brevius petiolatis, inflorescentia multo breviore, inter alia, distinguenda.

Planta volubilis ; rami graciles, dense breviterque crispato-pubescentes, internodiis saepius 6–8 cm. longis. *Folia* ovata, basi rotundata vel parum cordata, apice breviter acuminata, 3·8–8 cm. longa, 2·4–6 cm. lata, chartacea, supra pilis brevibus parce pubescentia, subtus densius crispato-pubescentia praesertim ad costam nervosque, costa nervisque supra subplanis vel leviter impressis subtus cum nervis transversis prominentibus, nervis lateralibus 3–5 paribus acute ascendentibus ; petiolus saepius 4–10 mm. longus, dense pubescens, supra alte canaliculatus. *Inflorescentia* axillaris, cymosa, saepius folio dimidio brevior, omnino dense pubescens ; pedunculus communis 6–8 mm. longus ; pedicelli circiter 4 mm. longi. *Calyx* extra pubescens, intus basi glandulis 5 paribus praeditus, 5-partitus ; lobi ovati, obtusi, 1·5 mm. longi. *Corolla* subrotata, 5-lobata, extra glaber ; tubus 1·25 mm. longus, intus minute villosus ; lobi lineares, circiter 3·5 mm. longi, 1 mm. lati, basin versus minute villosus. *Gynostegium* 1 mm. altum ; coronae squamae minutae, antheris subaequilongae ; pollinia corpusculo oblongo paullo longiora, fusiformia, fere horizontalia ; stigmatis caput pentagonale, vertice leviter convexum et minute apiculatum. *Folliculi* immaturi ellipsoidales, subsuccosi, pruinosi, circiter 2·8 cm. longi.

Saraburi, Muak Lek, *Put* 1874.

Heterostemma gracile *Kerr* (Asclepiadaceae-Marsdenieae) ; inter congeneres foliis membranaceis caudato-acuminatis, coronae squamis stipitatis tubo corollae brevioribus distinguendum.

Frutex volubilis ; rami graciles, lineis pilosis duabus ornati, juventute insuper minute puberuli, nodis leviter incrassatis interdum ciliatis, internodiis 10–15 cm. longis. *Folia* elliptica vel ovato-elliptica, basi cuneata, apice acute caudato-acuminata, usque 11 cm. longa et 6·3 cm. lata, plerumque 6–8 cm. longa et 2·5–4 cm. lata, membranacea, glabra nisi supra secus costam nervosque leviter crispatim pubescentia, siccitate supra olivacea, subtus pallidiora, costa nervisque lateralibus supra subplanis subtus prominulis, rete venularum supra sub lente manifesto subtus obscuro, nervis lateralibus 3–4 paribus, imo jugo prope basin oriente, marginem versus valde arcuatis anastomosantibusque ; petiolus 2–5 cm. longus, gracilis, striatus, supra canaliculatus, canaliculi margine pubescens, supra ad laminae junctionem glanduliferus. *Flores* 3–7 in fasciculos axillares dispositi ; bracteae cito deciduae ; pedicelli filiformes, puberuli, 1·5–2 cm. longi. *Calyx* alte 5-partitus, extra puberulus, intus basi glanduliferus ; lobi ovato-oblongi, apice obtusi, ciliati, margine hyalini, circiter 1 mm. longi. *Corolla* rotata, lutea, glabra, 10–12 mm. diametro ; tubus explanatus, circiter 2·5 mm. longi ; lobi late triangulares, circiter 3·5 mm. longi. *Coronae lobi* plani, stellatim patentes, oblongo-subhastati, basi breviter stipitati incrassatique, apice obtusi, circiter 1·7 mm. longi, sinus inter corollae lobos haud attingentes. *Gynostegium* brevissimum ; antherae parvae, apice inflexae, appendicibus margine hyalinis ; pollinia sessilia, ventricosa, margine interno recta hyalina apiculata ; corpusculum subrhomboideum. *Stigmatis caput* subplanum, inclusum. *Folliculi* non visi.

Doi Chiengdao, circiter 1400 m., in scrub, *Kerr* 6535.

Heterostemma succosum *Kerr* (Asclepiadaceae-Marsdenieae) ; species *H. oblongifolio* Cost. affinis, foliis majoribus siccitate multo tenuioribus distinguitur.

Frutex scandens ; rami sinistrorsum volubiles, minute puberuli et lineis pilosis bifariis praediti, siccitate fistulosi, nodis leviter incrassatis, internodiis circiter 12–18 cm. longis. *Folia* oblongo-ovata, basi rotundata, apice breviter acuminata mucronata, 11–22·7 cm. longa, 4·6–9·8 cm. lata, vivo succosa (ex *Garrett*), sicco membranacea, utrinsecus pilis minutis parce inspersa, costa nervisque lateralibus supra impressis subtus prominulis, subtus basin versus costa etiam leviter alata, nervis lateralibus 4–5 paribus angulo 35°–45° e costa ascendentibus ; petiolus 2·6–3·5 cm. longus, anguste canaliculatus, minute puberulus, supra ad laminae junctionem glanduliferus. *Inflorescentia* axillaris, cymosa, pauciflora, pedunculo 3–6 mm. longo suffulta ; bracteae cito deciduae ; pedicelli usque 16 mm. longi, minute puberuli. *Calyx* alte 5-partitus, extra puberulus, intus basi glanduliferus ; lobi oblongo-ovati, apice obtusi, circiter 2 mm. longi, 1 mm. lati. *Corolla* rotata, flava et

basin versus brunneo-maculata (ex *Garrett*), supra glabra subtus minute puberula, 17 mm. diametro ; tubus explanatus, 3·5 mm. longus ; lobi triangulares, 5 mm. longi, basi 4 mm. lati. *Coronae* squamae curvatae, parte basali suberectae, parte distali radiato-patentes, basi incrassatae, apice rotundatae, circiter 2 mm. longae. *Antherae* minutae, incurvae ; pollinia sessilia, subrhomboidea, margine interno recta pellucida apiculata ; corpusculum oblongum. *Carpella* glabra, cum stigmate circiter 1·75 mm. alta ; stigmatis caput pentagonale, planum. *Folliculi* ignoti.

Chiengrai, Ban Tam Ta Kaw, circiter 440 metres, *Garrett* 191.

Dittoceras Garrettii *Kerr* (Asclepiadaceae-Marsdeniae) ; species *D. Andersonii* Hook. f. affinis, foliis majoribus oblongis apiculatis differt.

Frutex volubilis ; rami robusti, siccitate fistulosi, sat dense crispatim cinnamomeo-pubescentes, internodiis 14–23 cm. longis. *Folia* oblonga vel ovato-oblonga, basi rotundata vel late cuneata, apice rotundata apiculata, 9–14 cm. longa, 5·3–8·5 cm. lata, papyracea, siccitate supra olivacea subtus flavo-brunnea, supra subtusque pilis brevibus basi bulbosis sat copiose induta, costa nervisque supra prominulis subtus subplanis, costa subtus basin versus parum alata, nervis lateralibus utrinque 4–5, marginem versus valde arcuatis anastomosantibusque ; petiolus striatus, supra canaliculatus, apice glanduliferus, pubescens, 4–5·5 cm. longus. *Flores* 1–3 in fasciculos axillares dispositi ; pedicelli graciles, 3–4·5 cm. longi. *Calyx* extra dense pubescens, intus glaber basi glanduliferus ; lobi oblongi, apice obtusi, circiter 4 mm. longi, 2 mm. lati. *Corolla* rotata, lutea (ex *Garrett*), supra glaber, subtus pilis particoloratis dense fulvo-pubescens, 35 mm. diametro ; tubus explanatus, circiter 7 mm. longus ; lobi triangulares, circiter 11 mm. longi, basi 8 mm. lati. *Coronae squamae* stellatim patentes, apice breviter acuminatae, medio cornu parvo recurvo praeditae, basi contractae, 2·5 mm. longae, nigro-brunneae margine fulvae (ex *Garrett*). *Antherae* minutae, apice incurvae, margine pellucidae ; pollinia sessilia, ventricosa, margine interna recta hyalina apiculata, corpusculo oblongo. *Carpella* brunneo-villosa, cum stigmate circiter 2·5 mm. alta ; stigmatis caput vertice leviter convexum. *Folliculi* non visi.

Doi Angka, circiter 1740 metres, in evergreen, *Garrett* 534.

Dittoceras maculatum *Kerr* (Asclepiadaceae-Marsdenieae) ; a *D. Andersonii* Hook. f. floribus minoribus differt.

Frutex volubilis ; ramuli striati pilis fulvis patentibus induti, nodis leviter incrassatis, internodiis 8–15 cm. longis. *Folia* ovata vel oblongo-ovata, basi leviter cordata, apice acute acuminata, 7·2 cm. longa et 4·2 cm. lata usque 13 cm. longa et 7·9 cm. lata, chartacea, siccitate supra viridi-fusca, subtus fulvo-cinerea, multo pallidiora, supra pilis brevibus adpressis copiose inspersa, subtus pilis fulvis basi bulbosis induta, costa nervisque lateralibus supra subtusque prominulis, subtus valde conspicuis, nervis lateralibus 4–5 paribus

arcuato-ascendentibus et sat longe a margine anastomosantibus ; petiolus 2–3 cm. longus, sulcatus, pilosus, supra plano-convexus, apice glanduliferus. *Flores* in fasciculos axillares paucifloros dispositi ; bracteae minutae ; pedicelli 10–13 mm. longi, tomentosi. *Calyx* alte 5-partitus, extra flavo-tomentosus, intus basi glanduliferus ; lobi oblongo-ovati, circiter 3 mm. longi, 1 mm. lati. *Corolla* rotata, lutea, purpureo-maculata, circiter 19 mm. diametro, extra pilis particoloratis sat dense fulvo-tomentosa, intus glabra ; tubus explanatus, circiter 4 mm. longus ; lobi triangulares, 6 mm. longi, basi 5·5 mm. lati. *Coronae squamae* radiato-patentes, oblongae, basi breviter stipitatae et callo obscure trilobato praeditae, apice obtusae. *Antherae* minutae, incurvae ; pollinia sessilia, ventricosa, margine interno recta pellucida et apiculata, corpusculo oblongo. *Carpella* villosa, cum stigmate 2 mm. alta ; stigmatis caput pentagonale, planum, inclusum. *Folliculi* haud visi.

Dan Sai, Pu Lom Lo, circiter 1400 m., in bamboo forest, *Kerr* 5776.

Though neither of the two species here assigned to *Dittoceras* have fruit, they seem to be rightly placed there on account of their comparatively large flowers and, more particularly, the character of the tomentum on the exterior of the corolla and the villous ovary. In both the Siamese species this tomentum is fairly dense and composed of hairs which show a reddish beading on a clear ground. On re-examining the type sheet of *D. Andersonii* the tomentum on the corolla was found to be similar to that of the two species described here, and the ovary was seen to be distinctly villous, a character not mentioned in the original description.

Hoya erythrostemma *Kerr* (Asclepiadaceae-Marsdenieae) ; species *H. ellipticae* Hook. f. affinis, foliis majoribus acuminatis, corolla villosa, inter alia, differt.

Frutex volubilis ; rami subquadrati, sat graciles, dispersim radicantes. *Folia* elliptica, basi acuta, apice leviter acuminata acuta, usque 10 cm. longa, 4 cm. lata, siccitate papyracea, glabra, costa cum nervis lateralibus et transversis utraque pagina praecipue supra prominulis, nervis lateralibus 5–6 paribus e costa angulo 60° abeuntibus et nervo marginali a margine 3–6 mm. distante conjunctis ; petiolus sat robustus, glaber, 3–6 mm. longus, supra angustissime canaliculatus. *Inflorescentia* lateralis, umbellata ; pedunculus glaber, circiter 14 mm. longus ; pedicelli graciles, glabri, 12–14 mm. longi. *Flores* albi, corona sanguinea (ex *Kloss*), explanati circiter 10 mm. diametro. *Calyx* 5-partitus ; lobi ovati, acuti, glabri, margine minute erosi, 1·5 mm. longi. *Corolla* 5-lobata, subrotata, sub anthesin reflexa, supra praecipue ad marginem et lobos sat longe villosa ; tubus explanatus, circiter 2 mm. longus ; lobi late ovati, breviter acuminati, circiter 3 mm. longi, 5 mm. lati. *Coronae segmenta* cartilaginea, nitentia, lateraliter valde compressa, 3 mm. longa, basi 1·75 mm. alta, apice exteriore acuta, apice interiore antheris paulo breviora. *Stigmatis caput* umbelliforme, apice umbonatum. *Folliculi* desunt.

Tasan, *Kloss*, 6909.

Parkinson 1680, from Thebyu Chaung, South Tenasserim, also belongs here. It differs from the type in its longer petioles, which are up to 2 cm. in length.

Hoya graveolens *Kerr* (Asclepiadaceae-Marsdenieae); *H. ovalifoliae* Wight et Arn. affinis, foliis crassioribus, nervis obscuris distinguenda.

Suffrutex volubilis; rami subquadrati, cortice lenticellis rotundis elevatis asperso obtecti. *Folia* oblongo-elliptica vel oblongo-oblanceolata, basi late cuneata vel rotundata, apice breviter acuminata, margine plana, 5–8·3 cm. longa, 2–3·8 cm. lata, coriacea, glabra, costa supra impressa subtus subplana, nervis lateralibus 4–5 paribus angulo 60° ascendentibus saepius obscuris rarius aegre aspectabilibus; petiolus 4–6 mm. longus, crassus, supra concavus, glaber. *Inflorescentia* lateralis, umbelliformis, pedunculata, 8–12-flora; pedunculus sat robustus, 1·8–3·8 cm. longus, glaber; rhachis crassa, accrescens, usque 5 cm. longa; pedicelli graciles, glabri, vel apicem versus pilis paucis obsessi, 1·4–1·8 cm. longi. *Flores* graveolentes. *Calyx* 5-lobatus, extra parce hirsutus, intus glandulis minutis praeditus; lobi anguste ovati, ciliati, circiter 2 mm. longi, basi 1 mm. lati. *Corolla* alba, rotata, extra glabra, intus puberula; tubus explanatus, 3 mm. longus; lobi ovati, acuminati, 5·5 mm. longi, basin versus 5·5 mm. lati. *Coronae segmenta* rosea, distaliter paullum surrecta, lateraliter leviter compressa, dorso convexa, 3 mm. longa, angulo externo obtusa, angulo interno in dentem acutum erectum producta. *Antherae* appendix coronae aequilonga; pollinia oblonga, corpusculo apice acuto multo longiora. *Stigmatis caput* disciforme, apice apiculatum, apiculo minute bifido. *Folliculi* 8–10 cm. longi, apicem versus sensim attenuati, siccitate leviter striati, vivo flavi nigro-purpureo-maculati; semina circiter 5·5 mm. longa, 1 mm. lata, compressa, minute punctata, apice comosa, basin versus pilis longis paucis praedita.

Sriracha, climbing on bushes near sea, flowers with an offensive smell, *Kerr* 4245 (*type*); Sriracha, on trees by shore, *Kerr* 4138.

The description of the fruit and seeds has been drawn up from *Kerr* 4138.

Hoya oreogena *Kerr* (Asclepiadaceae-Mardenieae); species *H. carnosae* R. Br. valde affinis, foliis minoribus ellipticis, coronae segmentis crassioribus distinguenda.

Suffrutex volubilis; rami subquadrati, sat graciles, juventute pilis brevibus patenti-deflexis basi bulbosis inspersi. *Folia* elliptica, basi cuneata vel anguste leviterque auriculata, apice subobtusa, margine plus minusve reflexa, 5–7 cm. longa, 1·8–2·9 cm. lata, coriacea, supra glabra, subtus pilis brevibus fulvis sat copiose induta, siccitate costa supra obscura subtus leviter prominula basin versus anguste alata, nervis lateralibus utrinque obscuris; petiolus

crassus, verrucosus, pilosus, 5–8 mm. longus. *Inflorescentia* lateralis, umbellata, multiflora ; pedunculus sat robustus, pilosus, 5–11 mm. longus ; pedicelli graciles, pilis crispis paucis inspersi, 15–24 mm. longi. *Calyx* alte 5-fidus, extra crispatim pubescens, intus glandulis minutis praeditus ; lobi oblongi, obtusi, circiter 2·5 mm. longi. *Corolla* pallide rosea, rotata, extra glabra, intus loborum apicibus exceptis dense villosa, explanata circiter 18 mm. diametro ; tubus circiter 4 mm. longus ; lobi late ovati, acuti, margine et praesertim apice reflexi, 5 mm. longi, basi 5·5 mm. lati. *Coronae segmenta* radiato-patentia, nitida, anguste lanceolata, supra convexa, circiter 4 mm. longa, angulo externo acuto, angulo interno leviter sursum flexo acuto. *Antherae* appendix membranacea, acuta, coronam excedens ; pollinia circiter 1 mm. longa ; corpusculum panduriforme, 0·5 mm. longum. *Stigmatis caput* conicum, apice umbonatum ; carpella glabra, circiter 2 mm. alta. *Folliculi* desunt.

Prachuap, Kao Luang, circiter 1200 m., *Kerr* 10857.

Hoya pachyclada *Kerr* (Asclepiadaceae-Marsdenieae) ; *H. diversifoliae* Blume affinis, sed foliis floribusque majoribus, coronae segmentis subacutis recedit.

Frutex epiphyticus ; rami robusti, subsuccosi, juventute minute fusco-puberuli, 6–8 mm. diametro. *Folia* obovata, basi cuneata vel subrotundata, apice brevissime obtuseque acuminata, 7·8–10·5 cm. longa, 5·2–6 cm. lata, crasse coriacea, utraque pagina pilis paucis brevibus conspersa, siccitate costa nervisque utrinque obscuris sed per lucem transmissum visis manifestis, nervis lateralibus 2 paribus a basi (vel fere ad basin) orientibus atque acute arcuato-ascendentibus fere apicem attingentibus ; petiolus crassus, supra concavus, minute puberulus, 6–12 mm. longus. *Inflorescentia* lateralis vel subterminalis, umbellata, pedunculata, multiflora ; pedunculus robustus, minute puberulus, 1·5–3·5 cm. longus ; pedicelli graciles, puberuli, 2–3 cm. longi. *Calyx* alte 5-fidus, extra minute puberulus ; lobi ovati, obtusi, minute ciliati, circiter 2 mm. longi. *Corolla* rotata, explanata circiter 17 mm. diametro, extra glabra, intus minute velutina ; tubus circiter 2 mm. longus ; lobi ovati, acuti, 7 mm. longi, basi 5 mm. lati. *Coronae segmenta* radiato-patentia, elliptica, circiter 4 mm. longa, dorso parum concavo medio umbonato, angulo externo subacuto vel leviter bifido, angulo interno brevi obtuso antherae appendice breviore. *Corpusculum* apice subulatum, polliniis multo brevius. *Stigmatis caput* membranaceum, alte 5-lobatum, apice apiculatum, apiculo minute bifido. *Folliculi* desunt.

Kawnken, Pu Wieng, circiter 300 m., on trees in deciduous *Pentacme-Shorea* forest, *Kerr* 20007.

In another collection of this species (Kanburi, Sisawat, *Kerr* 10221) the peduncles are very much longer than in the type, reaching a length of 12 cm.

Hoya rigida *Kerr* (Asclepiadaceae-Marsdenieae); species a congeneribus (§ *Euhoyae*) foliis rigidis 5-plinerviis, calycis lobis lineari-lanceolatis distinguenda.

Suffrutex volubilis, glaber; rami sat robusti, teretes vel subquadrati. *Folia* ovata vel ovato-elliptica, basi rotundata vel late cuneata, apice longe acuteque acuminata, margine anguste revoluta, 12–14 cm. longa, 4·5–6·3 cm. lata, siccitate rigide coriacea, durissima, supra nigro-brunnea, subtus fusca, utrinque opaca, e basi 5-plinervia, nervis utrinque plano-convexis, nervis transversis interdum prominulis; petiolus crassissimus, supra plano-convexus, 1·2–2 cm. longis. *Inflorescentia* lateralis, 25-flora vel ultra, umbelliformis, pedunculata; pedunculus robustus, circiter 2 cm. longus; rhachis usque 1·5 cm. producta, vel ultra; pedicelli graciles, glabri, ad 2·7 cm. longi. *Calyx* alte 5-fidus, glaber, extra basin versus minute papillosus, intus minute glanduliferus; lobi lineari-lanceolati, subacuti, 6 mm. longi, basi 1·5 mm. lati. *Corolla* rotata, interdum parum reflexa, explanata circiter 20 mm. diametro, extra glabra, intus velutina; tubus explanatus 3 mm. longus; lobi lanceolati, acuti, explanati circiter 8 mm. longi, 7 mm. lati. *Coronae segmenta* radiato-patentia, utrinque acuta, dorso leviter concava medioque parum carinata. *Antherae* appendix coronam leviter superans; pollinia oblonga, circiter 1 mm. longa, corpusculo rhomboideo multo longiora. *Stigmatis caput* membranaceum, 5-lobatum, apice minute bifidum; carpella glabra, 2 mm. alta. *Folliculi* ignoti.

Krat, Kao Kuap, *Put* 3034.

Dischidia calva *Kerr* (Asclepiadaceae-Marsdenieae); a *D. Scortechinii* King et Gamble, cui affinis, foliis minoribus, corollae lobis intus glabris nec villosis distinguitur.

Herba glabra; caulis gracilis, exsiccatus longitudinaliter rugosus. *Folia* elliptica vel lanceolato-elliptica, basi et apice acuta, 2–2·8 cm. longa, 0·6–1·1 cm. lata, costa nervisque obscuris; petiolus crassus, 2–4 mm. longus. *Inflorescentia* axillaris, subsessilis vel pedunculata; pedunculus usque 3 cm. longus; pedicelli circiter 1 mm. longi. *Calyx* submembranaceus, lobis ovatis obtusis 0·75 mm. longis. *Corolla* urceolata, alba; tubus circiter 1·8 mm. longus, intus extraque glaber; lobi anguste triangulares, intus incrassati, circiter 0·8 mm. longi, intus extraque glabri. *Coronae segmenta* late stipitata, semilunata, apice haud emarginata, brachiis brevibus, gynostegio breviora. *Antherarum* appendices appendiculatae; pollinia caudiculis parum longiora, corpusculo multo longiora. *Stigmatis caput* apice apiculatum. *Folliculi* ignoti.

Pang-nga, Kaw Kalat, on limestone rocks by the sea, *Kerr* 17314.

Dischidia rimicola *Kerr* (Asclepiadaceae-Marsdenieae); species inter congeneres ob radicem primariam lignosam, caules pubescentes radices adventitias haud vel rarius parientes, distinguenda.

Planta epiphytica; radix lignosa in arborum rimis affixa; caules saepius caespitosi, erecti vel leviter volubiles, graciles, pilis albis crispis brevibus leviter induti. *Folia* ovata vel lanceolata, basi cuneata vel rotundata, apice acuta, 1·4–2·1 cm. longa, 0·9–1·1 cm. lata, coriacea, subtus glabra, supra pilis brevibus parce inspersa, costa supra obscura subtus prominula et leviter alata, nervis lateralibus 2–3 paribus acute ascendentibus supra subtusque obscuris nisi subtus in foliis immaturis subprominulis; petiolus 1–2 mm. longus, crassus, pilis brevibus parce inspersus. *Inflorescentia* axillaris, sessilis, 3–5-flora; pedicelli circiter 1·5 mm. longi, pilis paucis inspersi. *Calyx* membranaceus, extra pilis parcissime inspersus; lobi ovati, obtusi, 0·8 mm. longi. *Corolla* urceolata; tubus subglobosus, intus extraque glaber, circiter 2·25 mm. longus; lobi anguste triangulares, extra glabri, intus villosi, circiter 1·75 mm. longi. *Coronae segmenta* sagittata, apice obtusa, brachiis stipite aequilongis. *Pollinia* oblonga, caudiculis aequilonga, corpusculo anguste elliptico multo longiora. *Folliculi* ignoti.

Krat, Kao Kuap, *Put* 2984.

Dischidia tricholoba *Kerr* (Asclepiadaceae-Marsdenieae); species *D. tubuliflorae* King et Gamble affinis, foliis basi cuneatis nec rotundatis, floribus minoribus, inter alia, distinguitur.

Planta epiphytica. *Caulis* scandens, gracilis, glaber. *Folia* elliptica vel ovato-elliptica, basi subacute cuneata, apice subacuta vel leviter rotundata, margine plana, 2·5–3 cm. longa, 0·8–1·3 cm. lata, subcarnosa, glabra, siccitate costa et nervis lateralibus supra obscuris nisi foliis junioribus prominulis, subtus prominulis, nervis lateralibus 3–4 paribus imo pari prope basin oriente et acute ascendente; petiolus 2–4 mm. longus, rugosus, supra alte canaliculatus, glaber. *Umbella* axillaris, 2–5-flora, floribus apice rhacheos crassae tuberculatae 1–2 mm. longae dispositis; pedunculus 1–2 mm. longus; pedicelli circiter 1·5 mm. longi, glabri. *Calyx* membranaceus, glaber; lobi ovati, circiter 1 mm. longi. *Corolla* anguste urceolata, alba, extra glabra, circiter 5 mm. longa; lobi anguste triangulares, intus parte media dense villosi, circiter 2 mm. longi; tubus intus glaber. *Coronae segmenta* membranacea, pertenuia, stipitata, erecta, semilunata, bibrachiata, brachiis recurvis stipite aequilongis. *Antherae* appendix oblonga, apice minute apiculata; pollinia oblonga, caudiculis aequilonga vel parum breviora; corpusculum anguste ellipticum, caudiculis multo brevius. *Stigma* alte 5-lobata, apice apiculata. *Folliculi* ignoti.

Pattani, Kao Kalakiri, c. 900 m., in evergreen forest, *Kerr* 7775.

Ceropegia jucunda *Kerr* (Asclepiadaceae-Ceropegieae); *C. trichanthae* Hemsl. valde affinis, foliis floribusque majoribus differt.

Planta scandens; caulis gracilis, teres, glaber, internodiis 9–16 cm. longis. *Folia* oblongo-lanceolata, basi cuneata vel fere rotundata, apice longius acute acuminata, 6·2–9 cm. longa,

1·2–2·1 cm. lata, membranacea, margine minutissime scabro-ciliata, ceterum glabra, costa supra leviter impressa, subtus prominula, nervis lateralibus 5–6 paribus supra subtusque conspicuis patentibus et arcuato-anastomosantibus ; petiolus 0·6–1·2 cm. longus, supra alte canaliculatus, apicem versus minute ciliatus. *Inflorescentia* pedunculata, 2–4-flora ; pedunculus 3·8–4·8 cm. longus, glaber ; bracteae subulatae, 1–1·5 mm. longae, glabrae ; pedicelli graciles, glabri, 1·5–1·8 cm. longi. *Calyx* alte 5-fidus, glaber ; lobi subulati, 6·5 mm. longi. *Corolla* glabra ; tubus circiter 2 cm. longus, basi globoso-dilatatus, sursum tubiformis deinde infundibulo-ampliatus, cinereus, brunneo-maculatus ; lobi e basi triangulari filiformes, apicem versus denuo ampliati, apice cohaerentes, purpurei, pilis candidis longis crispulis induti, 2·3 cm. longi. *Coronae* segmenta externa 10, triangularia, ciliata ; segmenta interna 5, duplo longiora et ultra, ciliata. *Folliculi* ignoti.

Sriracha, Nawng Kaw, c. 30 m., evergreen forest *Kerr* 2074.

Ceropegia siamensis *Kerr* (Asclepiadaceae-Ceropegieae) ; species *C. lucido* Wall. valde affinis, sed foliis basi rotundatis vel leviter cordatis, haud cuneatis, supra breviter pilosis distinguitur.

Planta scandens ; caulis gracilis, teres, glaber, internodiis vulgo 10–15 cm. longis. *Folia* ovata, basi rotundata vel leviter cordata, apice longe attenuata, acuminata, acuta, 6·2–10·6 cm. longa, 1·8–3·6 cm. lata, membranacea, supra breviter appresseque pilosa, subtus glabra, margine breviter ciliata, costa supra subtusque prominula, nervis lateralibus 5–6 paribus supra inconspicuis subtus prominulis arcuato-ascendentibus ; petiolus 1–1·7 cm. longus, gracilis, supra canaliculatus, apicem versus ciliolatus. *Inflorescentia* pedunculata, 2–6-flora ; pedunculus 1·7–2·5 cm. longus, glaber ; bracteae subulatae, circiter 1 mm. longae ; pedicelli 1–1·5 cm. longi, glabri. *Calycis* lobi subulati, glabri, 5 mm. longi. *Corolla* viridis, sanguineo-maculata ; tubus saepius parum curvatus, circiter 2·2 cm. longus, basi leviter dilatatus, sursum infundibulo-ampliatus ; lobi 1·6 cm. longi, basi triangulares, sursum versus attenuati, apice cohaerentes, longe ciliati praecipue apicem versus. *Coronae* segmenta externa 10, ciliata, 1·8 mm. longa ; segmenta interna fere duplo longiora, glabra. *Folliculi* fere horizontaliter patentes, laeves, graciles, glabri, 17–19 cm. longi ; semina linearia, complanata, pallide marginata, 7 mm. longa, coma alba.

Chiengmai, Me Teng, c. 500 m., evergreen forest by stream, *Kerr* 6470.

XLVI—RESEARCHES ON SILENE MARITIMA AND S. VULGARIS : XXIV*.

E. M. Marsden-Jones and W. B. Turrill.

Studies on non-British populations of S. vulgaris.

In K.B. 1931, 118, we dealt with plants and populations of *S. vulgaris* in and from various parts of Great Britain. In this

* Continued from K.B. 1939, 304.

present paper we record the analyses of samples of populations from non-British localities, grown from seed collected in the wild. The following samples and families are included here :—

P.1. Norway : Eidsfjordvand.
N.115=P.1 plant 11 selfed.
P.2. Switzerland : Schinige Platte.
N.108=P.2 plant 12 selfed.
N.113=P.2 plant 11 selfed.
N.114=P.2 plant 14 selfed.
N.128=P.2 plant 6 selfed.
P.3. E. Switzerland : Glärnisch.
N.139=P.3 plant 6 selfed.
N.141=P.3 plant 12 selfed.
N.142=P.3 plant 22 selfed.
N.158=P.3 plant 3 selfed.

P.1. Grown at Potterne from seed collected in Norway : by Eidsfjordvand, Hardanger, 4 to 5 miles inland, by rocks and along roadside, August 1929, Miss S. Dunn. Scored 22 June, 1931. 9 plants in the sample.

Habit : compact with ascending stems ; stems from 2·5–4·8 dm. long, mean length 3·3 dm. ; anthocyanin in vegetative parts, much 1 : medium 7 : little 1 ; overwintering " barren " shoots none.

Indumentum : glabrous.

Leaves : fairly uniform for all plants, linear-oblanceolate, strongly acute, ranging from 7 cm. long and 8 mm. broad to 6 cm. long and 1 cm. broad, for well-developed leaves.

Inflorescence : 8 to 32 flowers, mean 19 ; flowers all zygomorphic.

Calyx : inflated 3 : subinflated 4 : narrow 2 ; anthocyanin much 1 : medium 8.

Corolla : all white ; neither petals nor segments overlapping ; all bilobed ; all $\frac{3}{4}$ lobing ; small scale 5 : boss 4 ; anthocyanin blotch present 2 : absent 7.

Sex : hermaphrodite 2 : hermaphrodite and female 1 : female 6.

Filaments : 3 purple ; anthers 3 purple.

Stigmata : all purple ; immature seeds all white.

Mature capsules : all broadly ovoid and with reflexing teeth.

Mature seeds : all armadillo.

The plants were badly attacked by *Marssonina*. The plants tended to be short-lived under cultivation.

N.115. P.1 plant 11 selfed. 48 plants in the family.
P.1 plant 11 had stems 3·0 dm. high, much anthocyanin in vegetative parts and in calyx, up to 17 flowers per inflorescence, calyx subinflated, small scale, anthocyanin blotch absent, and hermaphrodite flowers.

Habit : as parent.

Indumentum : all glabrous.

Leaves : as parent.

Inflorescence : up to 27 flowers ; flowers all zygomorphic.

Calyx : all subinflated ; anthocyanin much 46 : medium 2.

Corolla : all white ; neither petals nor segments overlapping ; all bilobed ; all $\frac{3}{4}$ lobed ; small scale 11 : boss 37 ; anthocyanin blotch present 13 : absent 35.

Sex : hermaphrodite 27 : hermaphrodite and female 2 : female 19.

Filaments : purple 29 ; anthers purple 29.

Stigmata : all purple ; immature seeds all white.

Mature capsules : all broadly ovoid and with more or less reflexing teeth.

Mature seeds : all armadillo.

The material dealt with as P.1 and N.115 is of very considerable interest since it is composed of plants showing character combinations not clear-cut for either *S. vulgaris* or *S. maritima*. We determine it as *S. vulgaris* verging in some characters towards *S. maritima*. The characters by which we place the plant in *S. vulgaris* are : complete absence of overwintering " barren " shoots, many-flowered inflorescences, calyx shape, neither petals nor sepals overlapping in any of the plants, flowers zygomorphic, absence of well-formed coronal scales, immature seeds white, and high susceptibility to *Marssonina*. On the other hand, the compact habit (recalling that of *S. maritima* A.21 from Brecknock Beacons), the capsules with reflexing teeth, and the seeds all armadillo are *S. maritima* characters so far as the two species are represented in the Briitsh Isles. The height is an intermediate character. It should be noted that segregation did not occur for : habit, life-form, indumentum, leaf-shape, flower orientation, flower colour, absence of overlapping in petals and segments, lobing and depth of lobing of petals, colours of filaments, anthers, stigmata, and immature seeds, capsule shape, and testa pattern. Fluctuating characters are stem height (showing the range for the F_1 of *S. vulgaris* × *S. maritima*), flower number (showing the range for some populations of British *S. vulgaris*), small scale to boss (generally to be found in large *S. vulgaris* populations), and sex. Characters not regarded of specific importance are : anthocyanin in vegetative parts and calyx, absence of indumentum, corolla white, lobing and depth of lobing, anthocyanin blotch, colour of filaments, anthers, and stigmata, and sex. In N.115, from a selfing of a plant without anthocyanin blotch, the ratio of absent 3 : present 1 was obtained. This suggests that P.1 plant 11 was heterozygous for a blotch inhibitor.

P.2. Grown at Potterne from seed collected Switzerland : Schinige Platte, c.2050 m., 1929, Dr. W. Lüdi, comm. Dr. A. Becherer. Scored 23 June, 1931. 14 plants in the sample.

Habit : stems more or less spreading (more or less compact in No. 14), ascending at ends, from 4·0 to 6·2 dm. long, mean length

4·9 dm. ; anthocyanin in vegetative parts much 2 : medium 7 : little 5 ; overwintering " barren " shoots none.

Indumentum : short dense 11 : glabrous 3.

Leaves : fairly uniform for all plants, narrow lanceolate to oblanceolate, ranging from 4 cm. long and 1·2 cm. broad to 5 cm. long and 2·2 cm. broad, for well-developed leaves.

Inflorescence : 10 to 23 flowers, mean 15 ; flowers all zygomorphic.

Calyx : inflated 13 : subinflated 2 ; anthocyanin much 1 : medium 13.

Corolla : all white, except for very slight and fluctuating flushing in 5 plants ; petals not overlapping or contiguous ; segments overlapping or contiguous 8 : not overlapping or contiguous 6 ; all bilobed ; all $\frac{3}{4}$ lobing ; all small scale ; anthocyanin blotch present 13 : absent 1.

Sex : hermaphrodite 11 : hermaphrodite and female 3.

Filaments : all purple ; anthers all purple.

Stigmata : all purple ; immature seeds purple 13 : white 1.

Mature capsules : broadly ovoid 8 : obloid 6 ; all of the *S. maritima* type in having capsules with reflexing teeth.

Mature seeds : all tubercled.

N.108. P.2 plant 12 selfed 4 plants in the family.

P.2 plant 12 had short dense indumentum, medium anthocyanin in vegetative parts, calyx inflated with medium anthocyanin, segments overlapping, anthocyanin blotch present, and hermaphrodite flowers.

Habit : spreading and ascending at ends ; anthocyanin in vegetative parts much 1 : medium 3 ; overwintering " barren " shoots none.

Indumentum : short dense for all.

Leaves : mostly oblanceolate, and relatively uniform.

Inflorescence : up to 22 flowers ; flowers zygomorphic.

Calyx : inflated 3 : subinflated 1 ; anthocyanin much 1 : medium 3.

Corolla : all white ; petals none overlapping ; segments overlapping 3 : not overlapping 1 ; all bilobed ; all $\frac{3}{4}$ lobing ; all boss ; anthocyanin blotch present 1 : absent 3.

Sex : hermaphrodite 2 : hermaphrodite and female 1 : female 1.

Filaments : purple 3 ; anthers purple 3.

Stigmata : purple 4 ; immature seeds purple 2.

Mature capsules : none set.

Mature seeds : none set.

N.113. P.2 plant 11 selfed. 15 plants in the family (4 not scorable for flower characters).

P.2 plant 11 had short dense indumentum, medium anthocyanin in vegetative parts, calyx inflated with medium anthocyanin, segments overlapping, anthocyanin blotch absent, hermaphrodite and female flowers, and obloid capsules.

Habit : spreading and slightly ascending at ends ; anthocyanin in vegetative parts medium ; overwintering " barren " shoots none.

Indumentum : short dense 12 : glabrous 3.

Leaves : narrow lanceolate to oblanceolate, relatively uniform for the family.

Inflorescence : up to 30 flowers ; flowers zygomorphic.

Calyx : 11 inflated ; anthocyanin medium 11.

Corolla : white ; petals 11 not overlapping or contiguous ; segments 11 overlapping or contiguous ; 11 bilobed ; $\frac{3}{4}$ lobing 9 : $\frac{2}{3}$ lobing 2 ; boss 9 : small scale 2 ; anthocyanin blotch absent 11.

Sex : hermaphrodite 5 : hermaphrodite and female 2 : female 4.

Filaments : purple 7 ; anthers purple 7.

Stigmata : purple 11 ; immature seeds purple 7.

Mature capsules : obloid 11 : broadly ovoid 2 ; teeth reflexed.

Mature seeds : all tubercled.

N.114. P.2 plant 14 selfed. 32 plants in the family (7 not scorable for flower characters).

P.2 plant 14 had short dense indumentum, medium anthocyanin in vegetative parts, calyx inflated with medium anthocyanin, segments overlapping, anthocyanin blotch present, hermaphrodite and female flowers, and obloid capsules.

Habit : rather compact and ascending ; anthocyanin in vegetative parts much 20 : medium 5 ; overwintering " barren " shoots none.

Indumentum : short dense 28 : glabrous 4.

Leaves : narrow lanceolate to oblanceolate, fairly uniform and rather narrower than in N.108 and N.113.

Inflorescence : up to 27 flowers ; flowers zygomorphic.

Calyx : inflated 8 : subinflated 17 ; anthocyanin much 20 : medium 5.

Corolla : 25 white ; petals 25 not overlapping ; segments overlapping 23 : not overlapping 2 ; bilobed 22 : multilobed 2 ; $\frac{3}{4}$ lobing 22 : $\frac{2}{3}$ lobing 2 ; boss 22 : small scale 2 ; anthocyanin blotch present 3 : absent 21.

Sex : hermaphrodite 14 : hermaphrodite and female 2 : female 8.

Filaments : purple 16 ; anthers purple 16.

Stigmata : purple 24 ; immature seeds purple 9 : white 3.

Mature capsules : obloid 20 : broadly ovoid 9 ; teeth reflexed.

Mature seeds : tubercled 25.

N.128. P.2 plant 6 selfed. 12 plants in the family (9 not scorable for flower characters).

P.2 plant 6 had short dense indumentum, little anthocyanin in vegetative parts, calyx inflated, with medium anthocyanin, segments not overlapping, anthocyanin blotch present, and hermaphrodite and female flowers.

Habit : spreading and ascending at ends ; anthocyanin in vegetative parts much 1 : medium 2 ; overwintering " barren " shoots none.

Indumentum : 12 short dense.

Leaves : narrow lanceolate to oblanceolate and fairly uniform for the family.

Inflorescence : up to 19 flowers ; flowers zygomorphic.

Calyx : inflated 2 : subinflated 1 ; anthocyanin much 1 : medium 2.

Corolla : 3 white ; petals and segments not overlapping 3 ; bilobed 2 : multilobed 1 ; $\frac{3}{4}$ lobing 3 ; boss 2 : small scale 1 ; anthocyanin blotch present 1 : absent 2.

Sex : hermaphrodite 2 : hermaphrodite and female 1.

Filaments : purple 3 ; anthers purple 3.

Stigmata : purple 3 ; immature seeds not scorable.

Mature capsules : none set.

Mature seeds : none set.

The material dealt with under P.2, N.108, N.113, N.114 and N.128 represents a high mountain stock from the Alps. The original seed was received under the name " *Silene vulgaris* ssp. *prostrata* (=ssp. *alpina*)." All the plants are to be placed under *S. vulgaris* in the broad sense but they all show the character of reflexed capsule teeth, which is a character of *S. maritima*, as is also the high proportion of purple immature seeds. All the other characters are those of *S. vulgaris* except for the high proportion of small scales in P.1. Segregation occurred on selfing for : anthocyaninin in vegetative parts and calyx, indumentum, calyx shape, overlapping of segments, lobing and depth of lobing of petals, corona, anthocyanin blotch, sex, and mature capsules. The indumentum is of a short dense type which we have not found amongst British material of *S. vulgaris* but which we know is not uncommon amongst Alpine plants of the *S. vulgaris* group. N.108 and N.128 showed a high degree of sterility. The original population was heterozygous for sterility-fertility factors.

P.3. Grown at Potterne from seed collected E. Switzerland : Glärnisch, 1500 m., on limestone rubble, 1930, by Dr. H. Jenny, comm. Dr. A. Becherer. Scored 23 June, 1932. 38 plants in the sample.

Habit : stems tend to be prostrate at base or at a low angle to the ground, then ascending ; stems from 3·2 to 5·7 dm. long, mean length 4·5 dm. ; anthocyanin in vegetative parts much 30 : medium 8 ; overwintering " barren " shoots none.

Indumentum : short dense 26 : glabrous 12.

Leaves : oblanceolate, fairly uniform for all plants, strongly acute, ranging from 4·7 cm. long and 1·1 cm. broad to 6·2 cm. long and 1·5 cm. broad, for well developed leaves.

Inflorescence : 6 to 21 flowers, mean 12·5 ; flowers all zygomorphic.

Calyx : inflated 5 : subinflated 33 ; anthocyanin all much.

Corolla : petals none overlapping ; segments overlapping or contiguous 8 : not overlapping or contiguous 30 ; bilobed 33 :

multilobed 5 ; all ¾ lobing ; scale 1 : small scale 35 : boss 2 ; anthocyanin blotch present 12 : absent 26.

Sex : hermaphrodite 37 : female 1.

Filaments : purple 37 ; anthers purple 37.

Stigmata : purple 38 ; immature seeds purple 38.

Mature capsules : broadly ovoid 16 : obloid 22 ; all with reflexed teeth.

Mature seeds : tubercled 38.

N.139. P.3 plant 6 selfed. 22 plants in the family.

P.3 plant 6 had much anthocyanin in vegetative parts, short dense indumentum, calyx subinflated, with much anthocyanin, petals not overlapping, segments overlapping or contiguous, ¾ lobing, small scale, anthocyanin blotch absent, hermaphrodite flowers, filaments purple, anthers purple, stigmata purple, immature seeds purple, capsules obloid.

Habit : subspreading and subprostrate ; stems up to 4·2 dm. long ; anthocyanin in vegetative parts medium 17 : little 5.

Indumentum : all short dense.

Leaves : oblanceolate and fairly uniform for the family.

Inflorescence : up to 21 flowers ; flowers all zygomorphic.

Calyx : all subinflated ; anthocyanin medium 17 : none 5.

Corolla : petals overlapping or contiguous 8 : not overlapping or contiguous 14 ; segments overlapping or contiguous 10 : not overlapping or contiguous 12 ; bilobed 22 ; ¾ lobing 14 : ⅔ lobing 8 ; scale 1 : small scale 8 : boss 13 ; anthocyanin blotch present 6 : absent 16.

Sex : hermaphrodite 9 : hermaphrodite and female 5 : female 8.

Filaments : purple 11 : white 3 ; anthers purple 10 : 4 yellow-green.

Stigmata : purple 19 : white 3 ; immature seeds purple 16 : white 4.

Mature capsules : obloid 17 ; with reflexed teeth.

Mature seeds : tubercled 17.

Fruits and seeds set badly, owing to self-sterility.

N.141. P.3 plant 12 selfed. 10 plants in the family.

P.3. plant 12 had much anthocyanin in vegetative parts, indumentum short dense, calyx subinflated with much anthocyanin, petals and segments not overlapping or contiguous, boss, anthocyanin blotch present, hermaphrodite flowers, filaments purple, anthers purple, capsules broadly ovoid.

Habit : subspreading and suberect ; stems up to 4·4 dm. long ; anthocyanin in vegetative parts medium 9 : little 1.

Indumentum : short dense 7 : glabrous 3.

Leaves : narrow lanceolate to oblanceolate and fairly uniform for the family.

Inflorescence : up to 20 flowers ; flowers all zygomorphic.

Calyx : all subinflated ; anthocyanin much 1 : medium 9.

Corolla : petals and segments none overlapping or contiguous ; bilobed 10 ; ¾ lobing 10 ; boss 10 ; anthocyanin blotch present 5 : absent 5.

Sex : hermaphrodite 4 : female 6.

Filaments : purple 2 : white 1 ; anthers purple 3.

Stigmata : purple 10 ; immature seeds purple 9.

Mature capsules : broadly ovoid 7 : obloid 3 ; with reflexed teeth.

Mature seeds : tubercled 10.

N.142. P.3 plant 22 selfed. 60 plants in the family.
P.3 plant 22 had medium anthocyanin in vegetative parts, indumentum short dense, calyx inflated with much anthocyanin, petals and segments not overlapping or contiguous, bilobed petals, ¾ lobing, small scale, anthocyanin blotch present, hermaphrodite flowers, capsules broadly ovoid.

Habit : subspreading and subprostrate ; stems up to 7·5 dm. long ; anthocyanin in vegetative parts medium 38 : little 22.

Indumentum : all short dense.

Leaves : oblanceolate and fairly uniform for the family.

Inflorescence : up to 35 flowers ; flowers all zygomorphic.

Calyx : inflated 20 : subinflated 40 ; anthocyanin medium 45 : little 2 : none 13.

Corolla : petals not overlapping or contiguous 60 ; segments overlapping or contiguous 8 : not overlappint or contiguous 52 ; bilobed 52 : multilobed 8 ; ¾ lobing 58 : ⅔ lobing 2 ; small scale 4 : boss 56 ; anthocyanin blotch present 11 : absent 49.

Sex : hermaphrodite 58 : hermaphrodite and female 1 : female 1.

Filaments : purple 59 ; anthers purple 57 : yellow-green 2.

Stigmata : purple 57 : white 3 ; immature seeds purple 43 : white 17.

Mature capsules : broadly ovoid 8 : obloid 50 ; with reflexed teeth.

Mature seeds : tubercled 58.

N.158. P.3 plant 3 selfed. 25 plants in the family.
P.3 plant 3 had much anthocyanin in vegetative parts, glabrous stems and leaves, calyx subinflated with much anthocyanin, petals and segments not overlapping or contiguous, multilobed petals, small scale, anthocyanin blotch absent, hermaphrodite flowers, capsules obloid.

Habit : subspreading and subprostrate ; stems up to 5 dm. long ; anthocyanin in vegetative parts medium 1 : little 24.

Indumentum : all glabrous.

Leaves : narrow lanceolate to oblanceolate and fairly uniform for the family.

Inflorescence : up to 30 flowers ; flowers all zygomorphic.

Calyx : inflated 3 : subinflated 22 ; anthocyanin medium 24 : little 1.

Corolla : petals and segments none overlapping or contiguous ; bilobed 24 : multilobed 1 ; ¾ lobing 25 ; small scale 1 : boss 24 ; anthocyanin blotch present 3 : absent 22.

Sex : all hermaphrodite.

Filaments : all purple ; anthers all purple.

Stigmata : all purple ; immature seeds all purple.

Mature capsules : 24 obloid, with reflexed teeth.

Mature seeds : 24 tubercled.

Seeds and fruits set well.

The material dealt with as P.3, N.139, N.141, N.142, and N.158 was derived from E. Switzerland. We classify the plants under *S. vulgaris* s.l. but they show verging towards *S. maritima* in the high proportion of purple immature seeds and reflexing teeth of the capsules. The only characters that bred true for the original sample and the offspring families were reflexed capsule teeth and armadillo testas.

General Discussion.

The populations, samples of which are analyzed above, are decidedly different from any British populations so far discovered. Under the alpha taxonomy which has to be used at present they are to be classified as *S. vulgaris* s.l. since they show mainly characters of that species. On the other hand, the high proportions of purple immature seeds and, especially the reflexing teeth of the capsules are, for British material of the group, *S. maritima* characters. It should also be noted that the average number of flowers per inflorescence is intermediate between that for *S. vulgaris* and for *S. maritima* as shown by British material grown at Potterne under similar conditions. There appear to be three possible interpretations of the results : 1. The populations accumulated and became pure for several mutations which give characters parallel to those of *S. maritima* ; 2. The populations at some time in the past received certain genes from *S. maritima* by hybridization and afterwards became homozygous for these genes : this is very improbable for the two Swiss populations ; 3. The character combinations shown by these populations represent more primitive combinations than those shown by either British *S. maritima* or British *S. vulgaris*. Data accumulating from many sources is suggesting that the last may be the true explanation.

Summary.

In this paper plants grown from wild seed, and selfed offspring of certain of them from Norway and Switzerland (2 collections) are described for a general range of characters. These samples show peculiar combinations of characters which, it is suggested, may represent ancestral combinations from which *S. maritima* and more typical *S. vulgaris* have been derived.

The research on which this paper is based has been aided by a Royal Society Government Grant.

XLVII—ON THE FLORA OF THE NEARER EAST: XXI*.

ADDITIONS, ETC. TO THE FLORA OF CYPRUS.

A. K. JACKSON AND W. B. TURRILL.

Since the publication of the last series of new records for Cyprus (K.B. 1938, 460) further extensive collections have been received from Mrs. E. W. Kennedy and Mr. A. Syngrassides. Several species hitherto unrecorded from the island were found among the collections, and from the very complete material of *Sedum* sent by Mrs. Kennedy it has been possible to correct previous misconceptions of species in the section *Cyprosedum*. In addition to the records of species whose occurrence in the island was unknown, descriptions of two new species from Cyprus are included in the present paper.

Papaver Argemone *L.* Sp. Pl. 506 (1753) var. **glabrum** *Koch* Synops. Deutschl. Fl. ed. **1,** 29 (1835).

Platres, 1150 m., igneous mountain, fallow land, petals dull red-purple, 15.5.38, *Kennedy* 1173.

The species is not recorded for Cyprus by Holmboe (Stud. Veg. Cypr. 1914). It is a plant of cultivated ground occurring throughout Europe and the Orient from Scandinavia to Persia. The var. *glabrum* is distinguished by its almost glabrous capsules and has been recorded from central Europe, Syria, and Persia.

Fumaria asepala *Boiss.* Fl. Or. **1,** 135 (1867).

Chionistra north, 1940 m., igneous mountain, on a bank built long ago across a gully to make a snow pit, 1.7.38, *Kennedy* 1177.

Widely distributed in Asia Minor, extending eastwards to Persia.

Arabis auriculata *Lam.* Encycl. **1,** 219 (1784).

Xerokolymbos, 1340 m., rock in deep shade, above the stream, 6.4.38, *Kennedy* 1228; Kyros Potamos, 1200 m., shady rock, above the stream, 5.6.38, *Kennedy* 1229.

Occurs in central and southern Europe and in the Orient from Asia Minor to Persia. It has not apparently hitherto been found in Cyprus.

Sisymbrium orientale *L.* Amoen. **4,** 322 (1759).

Platres, 1100 m., dry mountain-side among the bushes of the garigue, yellow flower, 26.4.38, *Kennedy* 1232.

The species is a native of southern Europe and the Orient.

Camelina sylvestris *Wallr.* Sched. 347 (1822).

Platres, 920 m., garigue between vineyards on the dry mountain-side, 9.6.38, *Kennedy* 1239.

Common in central and southern Europe and the Orient from Greece to southern Persia.

Gypsophila porrigens (*L.*) *Boiss.* Fl. Or. **1,** 557 (1867); *Saponaria porrigens* L. Mant. 239 (1771).

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* Continued from K.B. 1939, 193.

Platres-Troödos, 1420 m., igneous mountain, in a soft bank of loose earth below the roadside, few plants, flowers pink, 20.6.38, *Kennedy* 1186.

The genus *Gypsophila* has not previously been recorded from Cyprus. This species is found in Asia Minor, Syria, Iraq, Persia, and Afghanistan.

Silene papillosa *Boiss.* Diagn. Ser. 1, **1,** 39 (1842).

Kato Platres, 890 m., by a stream running between vine-covered hills down to Kokkinovouno, 7.5.37, *Kennedy* 357.

This species has only previously been collected in Asia Minor.

Medicago Gerardi *Willd.* Sp. **3,** 1415 (1803).

Platres, 1150 m., fallow land, 27.4.38, *Kennedy* 1269 ; Platres, 1050 m., among the garigue on the dry mountain-side, 19.5.38, *Kennedy* 1271.

This species is widely distributed in the Mediterranean region extending into France and Central Europe in the north-west and to Persia in the south-east. It has not so far been recorded from Cyprus.

Trifolium hirtum *All.* Auct. 20 (1789).

Platres, 1230 m., among bushes of the garigue on a dry mountain-slope, flowers russet-pink, 26.4.38, *Kennedy* 1272 ; Platres, 1150 m., garigue on a dry mountain-slope, flowers russet-pink, 18.5.38, *Kennedy* 1286.

A common Mediterranean species.

Trifolium leucanthum *M.Bieb.* Taur. Cauc. **2,** 214 (1808).

Platres, 1230 m., rocky ground under pine trees, flowers white, 13.5.38, *Kennedy* 1283 ; Platres, 1050 m., garigue on the dry mountain-side, 19.5.38, *Kennedy* 1284.

The species (sensu lato) occurs locally in the Mediterranean region.

T. striatum *L.* Sp. Pl. 770 (1753).

Platres, 1150 m., fallow land, 15.5.38, *Kennedy* 1280.

This widely distributed species occurs from southern Europe to Persia.

T. glomeratum *L.* Sp. Pl. 770 (1753).

Platres, 1150 m., fallow land, flowers white, 15.5.38, *Kennedy* 1281 ; Platres, 1230 m., among bushes under pine trees, 3.6.38, *Kennedy* 1279.

This species is common in western Europe, the Mediterranean Region, and the Orient.

Lotus angustissimus *L.* Sp. Pl. 774 (1753).

Locis subhumidis prope Prodromo in mt. Troödos, 30 junio 1880, *Sintenis et Rigo* 815.

Although collected as long ago as 1880 by Sintenis and Rigo, this species seems to have been overlooked by later investigators

of the flora of Cyprus. It is widely distributed in Europe, the Orient, and Northern Asia.

Sedum cyprium *A. K. Jackson et Turrill*, sp. nov. a *S. Lampusae* et *S. microstachyo* floribus minoribus differt ; a priore foliis radicalibus angustioribus inflorescentia breviore differt ; a posteriore foliis radicalibus glabris facile distinguitur.

Herba annua vel biennis, erecta, 0·7–3·3 dm. alta, rhizomate crasso circiter 1 cm. diametro. *Folia* radicalia in rosulam usque ad 9 cm. diametro disposita, obovato-spathulata, apice rotundata vel obtusa, basi attenuata, 2–4·5 cm. longa, 0·5–1·2 cm. lata, glabra, crassa ; caulina sessilia, elliptica vel obovato-elliptica, apice obtusa vel subacuta, 0·4–0·7 cm. longa, 0·3–0·5 cm. lata, glabra vel sparse pubescentia, margine glanduloso-ciliolata, decidua ; floralia caulinis subsimiles sed minores, decidua. *Inflorescentia* subcylindrica vel pyramidata, e cymis superpositis composita, 0·5–2·2 dm. longa, basi usque ad 4·5 cm. diametro, tota plus minusve dense glanduloso-pubescentia. *Calyx* glanduloso-puberulus, dentibus lanceolato-triangularibus acutis 1–1·25 mm. longis circiter 0·5 mm. latis basi connatis. *Petala* lanceolata vel lineari-lanceolata, apice acuminata, 2·5–3 mm. longa, circiter 1 mm. lata, sordide brunneo-rubra, basi breviter connata. *Stamina* 10, circiter 1 mm. longa ; filamenta puberula vel glanduloso-puberula. *Folliculi* maturi, plus minusve erecti, rubro-brunnei, 3 mm. longi, glabri vel sparse glanduloso-puberuli, stylo subulato saltem duplo longiores. *Semina* rubro-striata, elongato-obovoidea, vix 0·5 mm. longa.

Ad rupes Mt. Troödos, July 1st, 1880, *Sintenis et Rigo* 893 (as *Umbilicus Lampusae* Kotschy) ; In rupibus circa Fini montis Troödos et apud monasterium Kikku, solo schistaceo, July 1st, 1880, *Sintenis et Rigo* 895 (as *Umbilicus Lampusae* Kotschy) ; Cyprus, 1230 m., in clefts in rocks, July 1914, *G. St. C. Feilden* ; Pedoulas, 1929, *C B. Ussher* 75 ; Kalkopetria, 770 m., on rocky terraces, June 30, 1936, *A. Syngrassides* 1266 ; Phini, 920 m., on a steep hump of rock looking like a clinker, high above the village, facing north, December 13, 1936, *Kennedy* 531 ; Kryos Potamos, in rock high above the stream in colonies of small numbers, 860 m.–980 m., June 16, 1937, *Kennedy* 524 (type) ; Chionistra-south, 1650 m., in rock on steep bare mountainside, June 30, 1937, *Kennedy* 525 ; Kokkinovouno, 890 m., in earth between red rocks on the steep mountainside, July 6, 1937, *Kennedy* 528 ; Platres, 1230 m., stony slope under Pine trees in a gully, few plants, October 2, 1938, *Kennedy* 1252 ; Kryos Potamos, 920 m., rock 30 m. above the river, many plants, October 10, 1938, *Kennedy* 1253.

S. cyprium is apparently confined to the Troödos range, where it occurs in rocky places mainly below 1500 m. *S. microstachyum* (Kotschy) Boiss., its nearest affinity, is also a Troödos endemic but this species is found at higher altitudes, from 1500 m. to 1980 m., the highest point in the island. Our plant was first collected by P. Sintenis and G. Rigo nearly sixty years ago and was erroneously

determined as *S. Lampusae* (Kotschy) Boiss. This latter species has only been found on the northern range and differs from *S. cyprium* in several important characters as shown below. Under *S. Lampusae*, Holmboe (Stud. Veg. Cypr. 93 : 1914) quotes three specimens—Kotschy's type specimen from Lapithos, Northern range, Sintenis and Rigo 895 from Fini, Troödos, and his own specimen from Kaminaria, Troödos (J.H. 1071). He does not appear to have seen Kotschy's type specimen of *S. Lampusae* for the Sintenis number 895 in Herb. Kew. is not *S. Lampusae* but *S. cyprium*, while J.H. 1071 (in Herb. Brit. Mus.) from Kaminaria is actually *S. microstachyum*.

Fröderström (The Genus Sedum pt. **3**, 16, pl. 10 : 1932) figures *Sintenis* 893, which is *S. cyprium* in Herb. Kew., as *S. Lampusae*, and there is no doubt from the plate that *S. cyprium* is the species actually represented. In the description, under *S. Lampusae*, the measurements of the flower are greater than in any of the specimens of *S. cyprium* in Herb. Kew but the remainder of the description mainly agrees with our plant.

Kotschy's type specimens of both *S. Lampusae* and *S. microstachyum* were received at Kew on loan from Vienna and our thanks are due to the Director of the Natural History Museum and to Dr. K. H. Rechinger for sending the specimens. Though unfortunately they have been mutilated, apparently by a previous borrower, the material is sufficient to show that our interpretation of the Cyprian species is correct. The type of *S. microstachyum* is a very diminutive specimen, 5 cm. in height, but the leaf shape and flower characters agree with the larger specimens at Kew quoted below. The flowering stem of the type of *S. Lampusae* is missing, but from the impression on the sheet it appears to have been about 3·4 dm. long. The basal rosettes have leaves up to 2·5 cm. broad. The material collected by Mrs. Kennedy on the Northern range, quoted below, undoubtedly belongs to this species.

Sedum Lampusae (*Kotschy*) *Boiss.* Fl. Or. **2**, 787 (1872) ; *Umbilicus Lampusae* Kotschy, Insel Cypern 312 (1865).

Plant 2–5·7 dm. in height. Basal leaves obovate, up to 2 cm. broad, slightly narrowed at the base, slightly puberulous. Petals 4 mm. long, 2 mm. broad, ovate-lanceolate with many red veins.

Kyrenia, 300 m., in the precipice, limestone, 6.11.36, *Kennedy* 520 ; St. Hilarion, Kyrenia range, 730 m., walls of ruined castle, limestone mountain, plant bronze colour, 22.7.38, *Kennedy* 1047 ; Buffavento, Kyrenia range, south, 920 m., cracks of rock, 28.7.38, *Kennedy* 1048 ; Bellapais, Kyrenia mnts., north, 340 m., rocks, walls, stony ground and hard sun-baked earth, 28.7.38, *Kennedy* 1049 ; Yalia, northern range, 920 m., cracks of rock, limestone mountain, 13.8.38, *Kennedy* 1050.

Sedum microstachyum (*Kotschy*) *Boiss.* Fl. Or. **2**, 787 (1872) ; Holmboe, Stud. Veg. Cypr. 93 (1914) ; *S. Lampusae* var. *microstachyum* Fröderström, The Genus Sedum, pt. **3**, 17 (1932) ; *Umbilicus microstachyus* Kotschy, l.c. 311.

Plant 0·7–3·7 dm. in height. Basal leaves linear-spathulate, up to 1·2 cm. broad, narrowed at the base, usually glandular-hairy and ciliate. Petals 6 mm. long, 2 mm. broad, lanceolate, few veined.

Ad rupes montis Troödos, 8.7.1880, *Sintenis et Rigo* 720; Crome-Troödos, 1840 m., on rocky ground, Sept. 1930, *C. B. Ussher* 91; Kryos Potamos, 1690 m., in rock 100′ above the stream, 24.6.37, *Kennedy* 526; Chionistra, south, 1690 m., in rock above a winter-time rivulet, 2.7.37, *Kennedy* 527; Chionistra 1940 m., in rock, facing north, 13.7.37, *Kennedy* 529; Troödos mnts., 1690 m., growing sparsely on igneous rocks amongst pines, July 1937, *C. H. Wyatt* 9; Kryos Potamos, 1690 m., on a flat rock, little above the stream, 9.10.37, *Kennedy* 530; Kryos Potamos, 1770 m., rock by the dry river bed, 22.6.38, *Kennedy* 1247; Kryos Potamos, 1750 m., cracks of steep rock by dry river-bed, plant green all over in the shade, turning blood-red in the sun, fading to bronze colour, red juice, 20.7.38, *Kennedy* 1051; Chionistra, 1910 m., 24.7.38, *Kennedy* 1052; Chionistra, 1820 m.–1910 m., rock on the northern slope, 9.8.38, *Kennedy* 1248; Valley of the Loumadho, E. of Chionistra 1540 m., 20.8.38, *Kennedy* 1254; Kryos Potamos, 1685 m., on rocks, 27.10.38, *Kennedy* 1249; Chionistra, south, 1640 m., 11.10.38, *Kennedy* 1251; Kryos Potamos, 1690 m., rock above the river, 30.10.38, *Kennedy* 1250.

Asperula pycnantha *Boiss.* var. **lasiocarpa** *Boiss.* Diagn. Ser. 1, **10,** 64 (1849).

Agios Andronikos (Karpass), 185 m., growing on borders of fields, wild, flowers yellow, 29.6.37, *Syngrassides* 1656.

This species has been previously recorded only from Syria.

Tyrimnus leucographus (*L.*) *Cass.* in Bull. Soc. Philom. 168, (1818); *Carduus leucographus* L. Sp. Pl. 820 (1753).

Polis-Pomos, 30 m., in the basins and borders of a dry river, much branched, broad basal leaves, flowers rosy violet when fresh, 18.5.38, *Syngrassides* 1843.

The species is generally distributed in southern Europe, Asia Minor, and Syria.

Salvia graveolens *Vahl,* Enum. **1,** 273 (1805).

Between Ambelikon and Karavostasi, 150 m., on the left side, near a big rock on the main road, a plant growing up to 2 ft. high, and bushy. Flowers whitish. 8.5.37, *Syngrassides* 1613.

This species has hitherto only been found in Syria and Palestine.

Herniaria micrantha *A. K. Jackson et Turrill,* sp. nov. ab *H. argaea* Boiss. floribus minoribus praecipue differt.

Planta perennis (?), caulibus prostratis ramosis herbaceis vel basem versus vix fruticulosis brevissime pubescentibus vel fere glabris 1·5–14 cm. longis. *Folia* spathulata, late obovata vel fere orbicularia, apice obtusa vel rotundata, 2–4 mm. longa, 1·5–2 mm.

lata, glabra vel plus minusve breviter hispido-pubescentia, margine pilis longis aliquando ciliata, saepe crassa ; stipulae inconspicuae, triangulari-ovatae, acutae, margine leviter ciliatae. *Inflorescentiae* saepissime densae, glomerulis usque ad 15-floris, floribus parvis pentameris. *Calyx* 1–1·5 mm. longus, sepalis inferne connatis ellipticooblongis apice obtusis saepissime circiter 1 mm. longis 0·5 mm. latis, plus minusve patule albido-hispidis interioribus membranaceomarginatis viridibus (pilis exceptis). *Stamina* minutissima. *Ovarium* ellipsoideum ; stigmata 2, brevia. *Semen* solitarium, rubro-brunneum bilenticulare, 0·5 mm. latum, margine acute carinatum (fere brevissime alatum).

Kryos Potamos, Troödos range, 1720 m., in gravel of dry river-bed, 3.6.37, *Kennedy* 419 (type) ; Chionistra, 1980 m., in gravel, facing north, 13.7.37, *Kennedy* 420 ; Chionistra, north, 1910 m., igneous mountain, rocky slope, 11.6.38, *Kennedy* 1163 ; Kanoures Springs, 1610 m., igneous mountain, northern slope, E. of Chionistra, damp black earth in deep shade, 2.7.38, *Kennedy* 1162 ; Kryos Potamos 1720 m., igneous mountain, in a crack of rock, under a juniper tree at the edge of the stream—now dry, 8.7.38, *Kennedy* 1164 ; Kryos Potamos, 1660 m., igneous mountain, wet ground by a spring, little above the river, 8.7.38, *Kennedy* 1165 ; Kryos Potamos, 1720 m., dry river-bed in rocks and stones and banks and ridges of gravel, 27.9.38, *Kennedy* 1224 ; Chionistra, 1940 m., northern flank, rocky slope, 3.10.38, *Kennedy* 1244 ; Kryos Potamos, 1720 m., 30.10.38, *Kennedy* 1245 ; Kryos Potamos, 1650 m., roadside and ditch above the river, 10.11.38, *Kennedy* 1255.

The oriental species of *Herniaria* are difficult to classify satisfactorily. The small flowers have invariably to be dissected in order to determine their characters. Boissier (Flor. Or. **1,** 741 : 1867) described *H. argaea* from Mt. Argaeus, Cappadocia, from material collected by Balansa. This species is undoubtedly very similar to *H. micrantha* but has larger flowers. All the specimens from Cyprus quoted (over 80 plants, all from the Troödos range) agree with one another in essential floral characters. The leaf-shape and degree of indumentum on both leaves and calyces shows some variation. Some of the plants probably behave as over-wintering annuals and others as short-lived perennials. Some appear to have flowered a second time in the same year.

Certain specimens from Asia Minor also having small flowers, come very near to *H. micrantha,* and may eventually have to be included in the one species. Material from Sultan Dagh has a calyx which narrows at the base more acutely than the calyx of *H. micrantha,* and is often provided with two membranous ridges in the lower part of the calyx. Specimens from the Smyrna district and from Mt. Ida also have a calyx more acutely narrowed at the base but have not the membranous ridges or wings.

These Asia Minor specimens have been, in part, confused with *H. densiflora* Williams (Bull. Herb. Boiss. **4,** 562 : 1896). This

species has, however, much larger flowers and appears, from the type specimen in the British Museum (Natural History), to be closely similar to *H. incana* Lam.

We desire to express our thanks to the Director of the Botanic Garden, Geneva, for the loan of the type material of *H. argaea*.

XLVIII—A NEW GENUS OF MELASTOMATACEAE FROM PERU.

H. A. Gleason.

Among the many rare and interesting plants collected last year by Mr. Christopher Sandeman on his travels in Amazonian Peru there was discovered a species of *Melastomataceae* which could not be referred to any known genus and is accordingly described as follows:—

Sandemania *Gleason*, gen. nov. (Tribus *Tibouchineae*). *Flores* numerosi, paniculati, 4-meri. *Hypanthium* herbaceum, leviter 8-costatum. *Calycis* tubus non productus; lobi breves lineares, dentibus exterioribus nullis. *Petala* acuta. *Stamina* paullo dimorpha; antherae graciles, subulatae, apice subrostratae, poro terminali dehiscentes; connectivum plus minus productum, basi antice appendiculo U-formi ornatum (ser. exter.) vel breviter bilobum (ser. inter.). *Ovarium* liberum, 2-loculare, glabrum. *Stylus* gracilis, ad stigma punctiforme angustatus.

Sandemania lilacina *Gleason*, sp. nov. *Frutex* bimetralis. *Rami* superiores subteretes, dense substrigosi et furfuracei, internodiis 1–2 cm. longis. *Petioli* 4–5 mm. longi, ut rami pubescentes. *Laminae* coriaceae, anguste oblongae, usque 50 mm. longae, 12 mm. latae, obtusae vel subacutae, integrae, basi obtusae, 5-nerviae, supra glabrae, subtus ad venas strigosae et furfuraceae ad paginam breviter hirtellae et minute et arctissime tomentosae; venae primariae supra alte impressae subtus elevatae; venulae obsoletae. *Panicula* terminalis floribunda, 1 dm. longa, axibus substrigosis et furfuraceis; bracteae late ovatae, 3 mm. longae; bracteolae ovatae vel lanceolatae, 1–2 mm. longae, ciliatae; pedicelli 1 mm. longi, villosuli. *Hypanthium* breviter cylindricum, 2·2 mm. longum, basi sparse hirtellum, setis intercalycinis brevibus. *Sepala* 0·7 mm. longa. *Petala* ovata, 3·5 mm. longa. *Filamenta* 5·2 vel 4·1 mm. longa, glabra; thecae leviter curvatae, 3·0 vel 2·6 mm. longae; connectiva 1·3 vel 0·4 mm. longa. *Ovarium* ellipsoideum, 1·4 mm. longum; stylus leviter sigmoideus, 3·9 mm. longus.

Peru. Dept. San Martin: Rioja, c. 900 m., Aug. 1938, *C. Sandeman* 170 (typus in Herb. Kew.); Jesus del Monte, near Moyobamba, c. 900 m., Aug. 1938, *C. Sandeman* sine no.

The publication of a new genus is always approached with diffidence, especially in a family whose numerous accepted genera might be presumed to cover all possible combinations of characters, or when based on a specimen without mature fruits or seeds, since the latter are necessary to confirm the tribal position of the plant. Nevertheless, long study of the American representatives of the

family has given me a certain degree of familiarity with all American genera and has convinced me that the accepted genera are almost without exception* well differentiated and easily recognized. The plant in question does not lie within the concept of any existing genus, nor can any concept be widened sufficiently to include it.

The character of its stamens, with two anterior basal lobes, refers it to *Microlicieae* or *Tibouchineae*, while its general aspect suggests the latter. Seeds are lacking to confirm its tribal position. In the former tribe, 4-merous flowers are found in several genera, but, except in *Siphanthera*, always in conjunction with short obtuse anthers; in *Siphanthera* half of the anthers are sterile or lacking and the whole vegetative aspect is different. Subulate anthers are found in various genera, but never in connexion with acute petals or 2-celled ovary. In the *Tibouchineae*, acute petals are typical of *Nepsera*, a monotypic genus with 5-merous flowers and different stamens. Four-parted flowers are found in *Acisanthera*, with different stamens and inflorescence, *Heterocentron*, with different stamens and foliage, *Arthrostemma*, with different stamens and hypanthium, *Ernestia* and *Appendicularia*, with entirely different stamens, *Brachyotum*, with different stamens and corolla, *Chaetolepis*, with different stamens and ovary, *Macairea*, with glandular filaments, *Pterogastra* and *Schwackea*, with winged hypanthium and setose ovary, *Pterolepis* and *Tibouchina*, with setose ovary and different pubescence, *Fritzschia* with different anthers and solitary flowers, *Marcetia* and *Aciotis*, with different stamens. Similar stamens are found in *Tibouchina* and *Pterolepis*, where the ovary is setose at the summit, and in *Comolia*; the glandular stamens of *Macairea* are also reminiscent of our plant in structure. In general aspect our plant most resembles *Macairea*, but differs in details of the connective, in the glabrous ovary, the non-glandular filaments, and the acute petals. From *Comolia* it differs in the connective, in its ample terminal panicle, and in its acute petals.

XLIX—MISCELLANEOUS NOTES.

The Vegetation of the British Isles.—"Types of British Vegetation," edited and partly written by A. G. Tansley, was published in 1911, and has long been out of print. It was a small octavo of 416 pages. The work† here under notice occupies over 900 pages of a large octavo size. A merely quantitative statement cannot, however, convey a correct impression of the great difference between the pioneer classic and the new volume which is intended to replace it. In the interval of nearly three decades ecology has come into its own, in the sense that the importance of both its

* For example, *Platycentrum*.

† "The British Isles and their Vegetation," by A. G. Tansley. Cambridge University Press, 1939. Pp. 930+xxxviii, 162 plates, 179 figures. 45*s*. net.

purely scientific and its applied aspects are now widely recognized. Probably no student of ecology will deny the need for an authoritative survey of recent ecological research on the vegetation of the British Isles. Such a survey has, of necessity, to be largely a compilation, but its success is to be judged not only by the degree of its accuracy and judicious selection of material but also by the general arrangement, the style, and the " readableness " of the completed work. As one expects from a British University press the format is excellent though two volumes in place of one would have had some advantages. It is impossible to do justice to this volume in a limited review and at rather short notice. First and general impressions only can be given.

The interesting preface should be read first and might well be followed by a reading of the author's presidential address to the British Ecological Society (Journ. Ecol. **27,** 513 : 1939). There are nine parts with a total of forty-three chapters making up the body of the book. The physical feature and geological history, climate, soil, and the biotic factor have one or more chapters apiece. It is particularly in the treatment of the edaphic factors that one notes at once the great advances of recent years in our knowledge of the physical environment of plants. In 1911 such terms as podsol, brown earth, and soil profile were not even mentioned and the study of the soil with dynamic concepts had scarcely commenced. The chapter on the biotic factor suggests strongly the wide field for experimental research of which preliminary investigation has given us glimpses.

The history and existing distribution of vegetation are considered in part two in three chapters. The " history," as here understood, commences with the influence of the Ice Age. A general summary of modern knowledge of Late Tertiary vegetation would have been useful. The development and extension of the methods of the pollen-analysis of peat bogs is aiding greatly in tracing the post-glacial history of our flora and vegetation. Much yet remains to be done and until intensive studies, autecological and cytogenetical in the widest sense, have been made on a large number of species, interpretation of peculiarities of existing distribution must remain tentative.

The most theoretical part is concerned with the nature and classification of vegetation in part three. Vegetation is differentiated into more or less easily distinguishable units or *plant communities.* The recognition, diagnosis, delimitation, and classification of these communities is a major concern of plant ecologists and there is still a great diversity of opinion and practice. In Britain there have not developed definite " schools " of ecological method—perhaps because of peculiarities in British psychology, perhaps because of the limitations of our natural vegetation—and this has certain advantages. Prof. Tansley is thus without national or regional bias in laying particular emphasis on the dynamic system of Clements.

While, however, placing the greatest importance on plant succession as a process and as a basis for the classification of plant communities, he rejects or considerably modifies some of Clements's subsidiary concepts. For example, he rejects the concept of vegetation as an organism and extends the use of the terms " formation," " association," and " climax " to other than communities of the climatic climax. With this extension of climax to communities maintained relatively permanently in a given state by dominance of edaphic or biotic factors the distinction between " climaxes " and " subclimaxes " seems none too clear. The synecologic importance of life-form is emphasized.

Parts four to nine deal with the communities of British plant-life, under the main headings (and in this sequence) : woodlands, grasslands, the hydroseres (freshwater, marsh, fen and bog vegetation), heath and moor, mountain vegetation, and maritime and submaritime vegetation. It is obvious that while the dynamics of vegetation are frequently referred to throughout the treatment of the different communities the classification is not strictly on a successional basis. Probably such a treatment is neither desirable nor possible at the present time, but one would have welcomed a summary of the main communities so arranged as to indicate their probable successional relationships so far as these are known or can be reasonably postulated.

The thirteen chapters dealing with woodlands (including scrub) give a relatively full account of the natural, semi-natural, and artificial woods of the British Isles. The dominant trees and the more important of the shrubs and woody climbers do not make a very long list, but floristic poverty is to some extent offset by the ecological interest of the high correlation between the kind of forest community and soil type. The oakwoods, beechwoods, ashwood, pine and birch woods, and alderwood are described with numerous examples and series of well-chosen photographs. Their variations, development, distribution, and particulars of the life-histories of their constituent members are given in sufficient detail to form the most comprehensive ecological survey of British woodlands that has yet been published.

The vast bulk of British grasslands, occupying a much greater area of country than any other type of vegetation, " are subclimax or (better) plagioclimax vegetation, i.e., vegetation stabilized by pasturing." A valuable general account of the grasslands is followed by three chapters on acidic, basic, and neutral grasslands respectively. The great economic value of grasslands and the fact that their proper treatment is a matter of economic importance is slowly being realized. Improvement can only follow ecological knowledge and this involves classification, description, and experiment. Such a summary of recent research as is presented by Prof. Tansley must be of the greatest use both for the actual information it gives and by indicating methods and directions for further research.

The fresh-water hydroseres include vegetation of ponds, lakes, rivers, marshes, fens, and bogs. The recent work on the Cumbrian Lakes by Pearsall and on fen and bog vegetation by Godwin and others is very adequately considered. Heath and moor vegetation are dealt with in two chapters and mountain vegetation in Part VIII which also consists of two chapters. The ecology of the Welsh and Scottish mountains still presents a wide field for research and one which might, in these days of cheap motor-cars, be well investigated by some of the younger ecologists.

Maritime and submaritime vegetation has naturally a great attraction for ecologists and around the British coasts there are still unspoilt salt-marshes, shingle beaches, and sand-dunes which show as wide a range of vegetation as can be found on any coasts of temperate regions comparable in length. In four chapters, the varied vegetation on mud, sand, and shingle is described, with special references to such classic areas as Blakeney Point, the Dovey Estuary, and the Chesil Beach. The vegetation of the sea and of the inter-tidal zones below the salt-marsh is not included.

An index of 28 two-column pages is provided and with the very adequate " Contents " at the beginning of the volume should provide a sufficient guide to the use of the volume as a book of reference. Lists of books and papers referred to in the text are given at the end of the chapters. It is, however, less as a work of reference than as a unified and fascinating account of British vegetation that the book will be appreciated. It will be read and pondered over rather than merely consulted and it should be accessible to and read by every botanist who wishes to obtain a well-balanced knowledge of the results and trends of a branch of his science with contacts which range from those with physiology to those with taxonomy. W. B. TURRILL.

Botany of the Living Plant.*—Some sixteen years have elapsed since the second edition of Professor Bower's well known text-book " Botany of the Living Plant " was published. The recent appearance of a new edition will be welcomed by all who are familiar with the many excellent qualities of the old one, and, it is to be hoped, by many new readers as well. In these days when many botanists try to read or at least to glance through a spate of literature which is often badly written or ill considered, it is indeed refreshing to return to the simple exposition of the basic facts and concepts of botanical science given by a master of his subject. Professor Bower, as is well known, possesses the qualification, somewhat rare amongst scientists, of being able to express complex ideas and facts in such a simple way that they can be understood by all who are willing to learn about them. One

* By F. O. Bower, Sc.D., LL.D., F.R.S., with the assistance of Professor J. M. F. Drummond, M.A., F.R.S.E. and G. Bond, B.Sc., Ph.D., third edition. Macmillan & Co., Ltd., London, 1939. Pp. ix+700. Price 25*s.* net.

wonders, by way of contrast, whether some of the more modern writers believe that complexity is a necessary concomitant of scientific value ! In preparing the third edition of his book, Professor Bower has been assisted by Professor J. M. F. Drummond and Dr. G. Bond. The general plan of the book has undergone but little change, but it is interesting to note that the most outstanding alterations are in those sections which deal with the physiological, cytological and genetical aspects of the subject, in which branches it will be generally agreed that most advances have taken place in recent years. The comparative lack of change on the morphological and anatomical side may be partly due to the fact that these branches of botany have meanwhile become relatively unfashionable, but it is also a tribute to the accuracy and careful observation of the older school of botanists who studied these subjects so well that their findings have required little modification. There is, however, an interesting new chapter on the Relation of Size and Form in Plants, in which the author quotes and discusses examples which support his working hypothesis that " Elaboration of form as the size of the individual increases is a means of maintaining the surface-volume ratio, which would otherwise tend to fall to a point of physiological inefficiency." Professor Bower admits that his views on this subject are not yet fully proved, but asks his readers at least to give them serious consideration and to maintain an open mind meanwhile. Other subjects dealt with in this edition for the first time include plant hormones, photoperiodism, the Psilophytales, and vitamins. The sections dealing with mycorrhiza, nitrogen fixation by the nodule bacteria of leguminous plants, alternation of generations, and the Equisetales have also been largely rewritten or amplified. As time passes on, interest in this or that branch of botany waxes or wanes, and there are corresponding differences of opinion concerning what a student should be taught. Professor Bower, as would be expected, has taken a wide view of the whole subject, so that the reader is enabled to see any one specialization in relation to the whole. One feels that a student who has thoroughly mastered the contents of this book and performed practical work in the laboratory and field at the same time will have received a firm grounding in his subject on which it would be difficult to improve.

C. R. METCALFE.

Hedges, Screens and Windbreaks.*—The author of this volume suggests on page 6 that the main reason for the use of hedges and screens in gardens is " protection against the unwanted intrusion of others and the desire for privacy." One of the first things that strikes a British visitor to eastern N. America, particularly in the neighbourhood of Boston, is the absence of hedges, fences and gates in the villa gardens. The publication of this book

* By Donald Wyman. The McGraw-Hill Publishing Company, Ltd., New York, 1938. Pp. 250 Illustrated. Price $2.75.

in the United States may perhaps indicate that American feeling in this matter is changing; indeed, the author states that "the problem of retaining privacy on the homegrounds is becoming increasingly important."

The book is divided into three parts: hedges, screens and their general culture; hedge plants listed according to various uses; and description of hedge plants. More than 250 different kinds of plants are mentioned, and the beginner may find difficulty in choosing those best-suited to his requirements. It is surprising that no mention is made of such well-known British hedging and screening plants as *Cotoneaster Simonsii, Rosa rubiginosa, Ligustrum ovalifolium aureovariegatum, Aucuba japonica, Rhododendron ponticum* and *R.* "Cunningham's White."

A "hardiness" map is given, divided into ten zones, based on temperature. This will certainly be useful to American readers. In some cases, however, it may prove to be misleading, as other factors besides temperature, such as soil, exposure, rainfall, etc., undoubtedly affect the hardiness of a species in a particular locality.

The publication of this useful volume should certainly stimulate interest in a neglected branch of American horticulture.

A. OSBORN.

A Flora of Assam.*—Volume 3 of this work has now appeared. The previous parts were reviewed in past issues of the Kew Bulletin (K.B. 1935, 586; 1937, 528; and 1938, 312). The present volume comprises the families from *Caprifoliaceae* to *Plantaginaceae*, as understood in the Genera Plantarum. More attention has been paid in this issue to correct nomenclature and there is a short discussion on the subject in the introduction. C. E. C. FISCHER.

Edible Wild Plants.†—As North America has been bounteously endowed by Nature with edible wild fruits and other edible plant products it is fitting that a fairly detailed and comprehensive work devoted exclusively to them should have been prepared. The writer remarks that it would probably be difficult to find a piece of woodland or an abandoned field that did not some time during the season produce one or more species of wild fruits that are edible raw, or could be prepared in some way for the table. It is not surprising therefore, that a good proportion (90 pages) of a volume of this sort should be devoted to wild fruits, the term "fruits" being used of course in its popular sense.

A similar richness in species applies in the case of edible nuts, some of which, such as the hickories, are not found in any other

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* By U. N. Kanjilal, A.Das, P.C. Kanjilal and K. N. De. Vol. 3. Published under the authority of the Government of Assam, 1939. Pp. x+578. Price Rs. 12.

† By O. P. Medsger. The Macmillan Co., New York, 1939. Pp. 323, 19 photographs+line drawings. Price 16*s.* net.

continent. The pecan (*Carya pecan*) is perhaps the best known of the indigenous American nuts and the one that has achieved most importance commercially, having now successfully invaded many oversea markets. Edible pine nuts, of which there are several, all on the western side of the continent, in themselves form an interesting group, being in this respect the equivalent of *Pinus Pinea* and *P. Cembra* in Europe. Pine kernels were of inestimable value as food to the North American Indians in days gone by. A short but interesting account of them is given.

Other sections of the book consist of—Edible Seeds and Seed Pods, Salad Plants and Pot-herbs, Edible Roots and Tubers, Beverage and Flavouring Plants, Sugars and Gums, and Mushrooms. These are followed by what are termed " finding indices," four in number and one for each of the four areas into which the author divides his territory. The object of these is to take the place of keys which the writer considers would have been too unwieldy to incorporate in a book of this sort. In them the species in the area in question are arranged alphabetically and their range, season and main characters briefly outlined. These " finding indices " do not take the place of, but are supplementary to a general index which serves the whole volume.

Probably the average adult of a civilized race to-day pays little attention to the wild fruits of his countryside, sharing the belief that " it takes a savage or wild taste to appreciate a wild fruit." This does not apply, of course, to small boys, those ever hungry mortals who relish fruits of all kinds in all stages of maturity. It is believed by some that interest in plants and therefore in botany is first aroused in a child when on excursions to the woods and fields in search of wild fruits and nuts, and that in plucking or gathering them children automatically become interested in the plants that produce them, where and how they grow, and their seasons. That this often is the case there can be little doubt. However, such fruits have other and more important uses. One which has come to the fore more and more in recent years is their great value in any comprehensive study of their cultivated descendants or prototypes among present-day food or crop plants, especially in the breeding and production of still better or more disease-resistant forms.

F. N. HOWES.

Common Water and Marsh Plants of India and Burma.*— A work of this nature should be welcomed, as there is no book on the subject which deals so extensively with the vegetation of the Indian freshwater lakes. Though written originally for the field worker of the Malaria Survey of the Government of India, it is more than a bulletin for this limited purpose. The introductory

* " Hand-Book of Common Water and Marsh plants of India and Burma," by K. Biswas and C. C. Calder. Malaria Bureau No. 11, Health Bulletin No. 24. Government of India. Manager of Publications, Delhi, 1937. Pp. xiii+140; 6 photographs, 32 plates. Price *Rs.* 2–12 or 5*s*.

pages deal with the ecology of water plants in the tropical climate of India, which will be appreciated both by the layman and by the trained botanist. The main part of the work is written in the style of a flora, with keys to genera and species, the latter comprising full descriptions. Here and there short ecological and geographical notes are given which make the work still more interesting. The difficulty of technical terms is eliminated by avoiding them as far as possible and by adding a glossary of those used. A large number of plates are included, with figures of practically all the plants described.

The authors are to be congratulated on bringing out such a handy book, which will be used extensively by field workers in India, and which will help many young botanists to appreciate the vegetable life of our freshwater lakes and pools. K. N. KAUL.

Biological Terms.*—From the botanical point of view, this dictionary is disappointing. Many of the definitions given are obsolete, incorrect or insufficient, and a number of terms used in plant ecology are omitted. A seed is defined as " a mature fruit containing an embryo ready for germination under suitable conditions " ; phanerogam as " a phaenogam or plant with conspicuous flowers " (" phaenogam " omitted) ; cryptogam as " a plant without apparent reproductive organs," and other examples could be quoted. It would appear that the authors have not had access to Daydon Jackson's " Glossary of Botanic Terms," which must always serve as a basis for any lexicographer of botanical terminology. It is to be hoped that if another edition is called for, the botanical section will be brought up to date and carefully revised.

* A Dictionary of Scientific Terms : Pronunciation, Derivation, and Definition of terms in Biology, Botany, Zoology, Anatomy, Cytology, Embryology, Physiology." By I. F. Henderson, M.A., and W. D. Henderson, M.A., B.Sc., Ph.D., F.R.S.E. Third Edition, revised by J. H. Kenneth, M.A., Ph.D., F.R.S.E. Oliver and Boyd, Edinburgh & London, 1939. Pp. xii + 385. Price 16*s*.

Printed under the authority of His Majesty's Stationery Office
By the South Essex Recorders, Ltd., Ilford.

(2466) Wt. 18/32 800 10/39 S.E.R. Ltd. **Gp. 381**